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AIR POLLUTION ABSTRACTS

29148-29810

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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 29148 - 29810.

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Author Index AI-1

Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given.

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As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.
Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography With Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

Odors and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:113, $3.00.

Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts, July 1972, GPO No. EP 4.9:110, $1.25.

Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:93, $0.45.

Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes), October 1970, GPO No. HE 20.1309:75, $5.00.

Nitrogen Oxides: An Annotated Bibliography, August 1970, GPO No. HE 20.1309:72, $2.75.

Air Pollution Translations: A Bibliography With Abstracts Volume I, May 1969, GPO No. FS 2.93/3:56, $1.75.

Air Pollution Translations: A Bibliography With Abstracts Volume II, April 1970, GPO No. HE 20.1309:69, $1.00.

Carbon Monoxide, A Bibliography With Abstracts. 1966, GPO No. PHS 1503, $2.50.

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RECENT CONTRACT AWARDS

from the

Durham Contract Operations
Contracts Management Division, EPA

Contract No. None listed, RFP No. Du-72-A096.. *$49,100*
INDUSTRIAL SOURCE STUDIES AND ENGINEERING EVALUATION SERVICES IN SUPPORT OF FEDERAL ENFORCEMENT OF AIR EMISSION REGULATIONS.
PEDCo-Environmental Specialists, Inc., Suite 8, Atkinson Square, Cincinnati, Ohio 45246 (NOTE: This contract contains eight options for 1,000 manhours each with a value for each option of $24,600)

Contract No. None listed, RFP No. Du-72-A096.. *$50,000*
INDUSTRIAL SOURCE STUDIES AND ENGINEERING EVALUATION SERVICES IN SUPPORT OF FEDERAL ENFORCEMENT OF AIR EMISSION REGULATIONS.
Pacific Environmental Services, Inc., 2932 Wilshire Blvd., Suite 202, Santa Monica, California 90403 (NOTE: This contract contains eight options for 1000 manhours each with a value for each option of $24,000)

Contract No. None listed, RFP No. Du-72-A096.. *$39,650*
INDUSTRIAL SOURCE STUDIES AND ENGINEERING EVALUATION SERVICES IN SUPPORT OF FEDERAL ENFORCEMENT OF AIR EMISSION REGULATIONS.
J. A. Commins and Associates, Inc., 506 Bethlehem Pike, Fort Washington, Pennsylvania 19034 (NOTE: This contract contains eight options for 1000 manhours each with a value for each option of $19,830)

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

EMISSION SOURCES

1973

29148 **APTIC NO. 51149**

CANADA-WIDE INVENTORY COMPLETED ON AIR POLLUTANT EMISSIONS. *Water and Pollution Control (Toronto), 111(3):92-97, April 1973. 8 refs.*

A nation-wide inventory on air pollutant emissions was completed in Canada. The study was based on 1970 data, and is expected to be continually updated at regular intervals. The updating, coupled with ongoing measurements of air pollution levels throughout Canada should give a clear indication of progress made in controlling air pollution. Pollutants covered in the inventory included: carbon monoxide, particulates, sulfur oxides, hydrocarbons, and nitrogen oxides. Five major categories of sources are outlined: transportation, fuel combustion in stationary sources, industrial processes, solid waste disposal, and miscellaneous sources. Each of these are briefly discussed. Findings showed that in 1970, transportation accounted for 57% of the total air pollutant emissions (31.2 million tons); one industrial sector -- primary copper and nickel -- accounted for 14% (4.5 million tons). Tables are presented for nationwide emissions by pollutant, and nationwide emissions by source.

29149 **APTIC NO. 51460**

Research Triangle Inst., Research Triangle Park, N. C.

THE DEVELOPMENT OF METHODOLOGY TO PERMIT PROJECTION OF AIR POLLUTION EMISSIONS FOR GEOGRAPHIC AREA. (FINAL REPORT). *Environmental Protection Agency Contract 68-02-0253, RTI Proj. 41U-723, APTD-1464, 163p., Feb. 1973. 47 refs.*

NTIS: PB 220433

A conceptual design of a model to project regional air pollution emissions is described. Existing national economic forecasting models were examined to determine the extent to which such a model could be disaggregated to provide regional forecasts. Only the OBERS model used by the U. S. Department of Commerce was appropriate, and its use was primarily to provide control totals by State. New model components would be required to project regional values for area and mobile sources and for each industrial source to be forecast. Mobile source emissions can be estimated on the basis of population, the stock of motor vehicles and its age composition, and vehicle use patterns. Area source emissions can be estimated on the basis of population, fuel use patterns, and projected employment. Industrial point source emissions will require the application of industrial growth and location theories to each industry individually. The required data is available or can be developed for each model component. The analysis sets forth the functional relationships of the proposed model, its structural and data requirements, and evaluates its limitations. (Author abstract)

29150 **APTIC NO. 51046**

Beychok, Milton R.

NOX EMISSION FROM FUEL COMBUSTION CONTROLLED. *Oil Gas J., 7(19):52-56, Feb. 26, 1973. 14 refs.*

Nitric oxide and nitrogen dioxide are produced under high-temperature conditions in the burning of fuels and by various biological reactions in nature. Combustion of fuel with air results in direct reaction of atmospheric nitrogen with atmospheric oxygen to form nitrogen oxides. Reaction thermodynamics greatly favor formation of NO rather than NO2 in the high-temperature zone. Further oxidation of NO to NO2 is favored at lower temperatures. Basic variables involved in formation of NO during fuel combustion are temperature, residence time, and percent of theoretical combustion air. Local and Federal regulations for emissions of NOx are presented. Reductions of 50% or more emissions of NOx can be achieved by using the combined techniques of low excess air, two-stage combustion, and flue-gas recirculation. The NOx emissions from gas turbine are tabulated. The much higher excess-air rate in a gas turbine results in the temperatures being lower than in a boiler. These lower temperature levels should produce less NOx than a boiler. Steam generators including gas-, oil-, and coal-fired boilers and process heaters in refineries are discussed.

29151 **APTIC NO. 51163**

Bower, Blair T., George O. G. Lof, and William M. Hearon

RESIDUALS IN MANUFACTURE OF PAPER. *Proc. Am. Soc. Civil Engrs., 99(EE1):1-16, Feb. 1973.*

The types and quantities of residuals generated in pulp and paper production are primarily a function of production variables including type of raw material, pulping method, bleaching sequence, papermaking process, and product output specifications, and secondarily a function of operating variables such as age of tree when harvested, method of wood storage, operation of digester and paper machine, and mill housekeeping. Typically a particular type of residual, e.g., particulates or dissolved organic solids, is generated at multiple and physically separated locations in the plant. After generation the residuals may be modified prior to discharge to the environment through by-product production at net cost, internal residuals reduction with some offsetting returns (e.g., increasing the efficiency of precipitators or wet cyclones), internal residuals reduction with essentially no offsetting returns (e.g., black liquor oxidation in kraft pulping), or waste treatment. The first two methods result in reduction both in the total amount of all residuals and in specific residuals discharged. The third and fourth measures, while decreasing certain residuals, may increase others and often increase the total residuals discharge. Scrubbing of gases, for example, increased liquid residuals; treatment of liquids may increase solids residuals; and incineration of solids may increase gaseous residues. The reduction in residuals discharge required/ton of paper produced by a 500 ton/day plant are shown for each of several possible production combinations. Also shown are the percentage removals presented by the absolute quantities. As more stringent discharge standards are imposed, the difficulty and cost of residuals management for the plant will rise at an increasing rate. Investment, design, and operation decisions require that residuals management costs be estimated and included in total production costs.

29152 **APTIC NO. 51546**

Collins, R. D. and D. M. DeVries

AIR CONCENTRATIONS AND FOOD RESIDUES FROM USE OF SHELL S NO-PEST INSECTICIDE STRIP.

Bull. Environ. Contamination Toxicol., 9(4):227-233, April 1973. 1 ref.

Fifteen homes in the Modesto, California area were selected for the test. The homes consisted of five centrally air-conditioned, five window air-conditioned, and five non-air-conditioned homes. Three or four 10 in. strips were installed in each of the 14 homes. Forty liters of air were collected from the dining area at table-top height. The sampling was accomplished by drawing the air at about 2 l/min through a glass impinger and trapping the Vapona in ethyl acetate. Food samples were secured for the breakfast and dinner meals only. Air concentrations in micrograms of Vapona per liter of air in the treated homes are presented. The homes having a minimum ventilation had the highest air concentration. The meal data for houses equipped with no air-conditioning, a wall unit air-conditioner, and central air-conditioning are tabulated. Of the 174 meals collected during the test, 24 contained 0.02 ppm Vapona, seven contained 0.03 ppm and five contained 0.04 ppm. Of the 36 meals containing discernible Vapona residues, 18 were breakfast and 18 were dinners.

29153 **APTIC NO. 51210**

Creagan, R. J.

BOON TO SOCIETY: THE LMFBR. *Mech. Eng., 95(2):12-16, Feb. 1973.*

The liquid-metal fast breeder reactor (LMFBR) will benefit the world in terms of greatly increased energy resources. It can utilize approximately 75% of the energy available from uranium ore compared with less than 2% utilization capability for enriched-uranium light-water reactors. With a breeding ratio of 1.3, the breeder produces 1.3 atoms of fissile plutonium from the abundant isotope uranium 238 for every atom of fissile plutonium it consumes, and thus doubles its inventory of plutonium every 12 years. Since a 1000-MW LMBFR electric plant burns up less than a ton of uranium/yr, 250,000 tons would supply present U. S. power requirements of 300,000 MWe for centuries. A cost-benefit analysis by the Atomic Energy Commission indicates benefits to the U. S. over a 34-year period of $21.5 billion, discounted at 7% to mid-1971. Thermal discharge is the principal different environmental effect between water and LMFBR reactors, neither of which release noxious chemicals. Because of its greater thermal efficiency, the LMFBR rejects 30% less heat to the environment than a water reactor. World status and plans for LMFBR power plants are given.

29154 **APTIC NO. 51100**

Davids, P.

AIR POLLUTION DUE TO THE EMISSION OF NOXIOUS SUBSTANCES FROM REFUSE INCINERATION PLANTS. *(Die Luftbelastung durch die Schadstoff Emission aus Muellverbrennungsanlagen). Preprint, 1973. 38 refs. (Presented at the Refuse Meetiong, 24th, Stuttgart, West Germany, March 8, 1973.) Translated from German, 36p.*

The quantity and quality of emissions from refuse incineration plants are examined. Gaseous emissions include hydrocarbons, e.g., aldehydes and organic acids, chlorine and fluorine compounds, sulfur dioxide, nitrogen oxides, and carbon monoxide. The dusts contain various metal compounds, including silver, aluminum, boron, calcium, cadmium, chromium, copper, iron, potassium, magnesium, manganese, sodium, nickel, lead, silicon, tin, strontium, titanium, and zinc. Waste composition and controls to prevent emissions were examined.

29155 **APTIC NO. 51325**

Derwent, R. G. and H. N. M. Stewart

AIR POLLUTION FROM THE OXIDES OF NITROGEN IN THE UNITED KINGDOM. *Atmos. Environ., 7(4):385-401, April 1973. 39 refs.*

A survey of the available literature on emissions of nitrogen oxides from moving and stationary sources is presented. Moving sources covered include: gasoline engines, diesel engines, and aircraft. Stationary sources include noncombustion sources, such as chemical processing of nitric and sulfuric acids, domestic heating sources, and various commercial and industrial sources. The reaction of nitrogen oxides in the atmosphere is described. Estimates of emissions in England are given by source, year, and region. Nitrogen oxides emissions are compared with other emissions of sulfur dioxide, carbon monoxide and hydrocarbons in England, and with nitrogen oxide emissions in the United States and world-wide. (Author abstract modified)

29156 **APTIC NO. 51333**

Eberan-Eberhorst, Robert and Dusan Gruden

THE INFLUENCE OF FUEL COMPOSITION ON ENGINE PERFORMANCE, EMISSION AND ODOR OF EXHAUST GAS OF FOUR-STROKE OTTO CYCLE ENGINES. *(Ueber den Einfluss der Kraftstoffzusammensetzung auf das motorische Verhalten, die Abgasemission und den Abgasgeruch des Viertakt-Otto-Motors). Text in German. Erdoel Kohle (Hamburg), 26(5):257-264, May 1973. 35 refs.*

The influence of fuel composition was studied on the power output, fuel consumption, exhaust gas composition, and odor intensity in a single-cylinder four-stroke Otto-cycle engine with inlet pipe injection in a wide air/fuel range. Seventeen model fuels on paraffin, olefin, aromatic, and alcohol bases cover the spectrum of marketable fuels for the Otto engines. Significant differences were not found. However, the reduction of carbon monoxide, hydrocarbons, and nitric oxide required by emission standards are of another order of magnitude. Isopropyl alcohol had the highest medium pressures and the highest fuel consumption because of its low heating value. Isopropyl alcohol has about 1% (by volume) less CO than all other fuels during operation with a lack of air. The higher the C/H ratio is in the fuel, the higher is the carbon dioxide concentration. For unsaturated hydrocarbons, the oxygen reaction with two-valent carbon dominates. The CO2 concentration in the exhausts from aromatics and olefins is therefore higher. The NO emission, too, is highest with aromatics, with isopropyl alcohol is the lowest. The latter produces the highest HC concentration, isooctane the lowest. In the exhaust gases of all fuels the following components were found in small, relatively harmless concentrations: formaldehyde, nitrogen dioxide, toluene, olefins (propylene, butylene), alcohols (methanol, ethanol), hydrocyanic acid, and ozone. The exhaust gas components can be divided into three groups, those decreasing with lamda, those increasing with lamda to a maximum then decreasing again, and those decreasing with lamda to a minimum and then increasing again. The maximum concentration of olefins and alcohols is measured at a lamda of 1.0 to 1.1. Nitrogen dioxide and hydrocyanic acid reach a maximum at lamda 1.2. The highest formaldehyde quantities were measured with the fuels toluene and isooctane.

29157 **APTIC NO. 51390**

Frank, Marshall E. and Bruce K. Schmid

COAL-OIL-GAS REFINERY OFFERS SNG, REFINERY FEED, LOW-SULFUR FUEL OIL. *Oil Gas J., 71(20):67-71, May 14, 1973. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 65th, New York, Nov. 26-30, 1972.)*

The process design, operating variables, costs, product values, and economic feasibility of a coal-conversion complex for the production of high-Btu pipeline gas, liquid feedstock for a petroleum refinery, and low-sulfur fuel for power plants were examined. The coal-oil-gas refinery would produce 332 MMcfd of 1065-Btu gas and 100,000 b/d of a coal-derived liquid, as well as liquid petroleum gas, solvent-refined coal, and sulfur as a by-product.

29158 **APTIC NO. 51511**

Furuhama, Shoichi and Kimitaka Yamane

COMBUSTION CHARACTERISTICS OF A HYDROGEN ENGINE. (CONTINUED REPORT). *(Suiso enjin no nensho tokusei (zokuho)). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, Inc., Tokyo, p. 45-50, 1973. (Presented at the Society of Automotive Engineers of Japan, Study Meeting, 27th, Tokyo, May 23-24, 1973, Paper 5.)*

The control of hydrogen without regulating the air intake in a hydrogen engine can cause unusual combustion if the excess air is made small, thus increasing nitrogen oxide emissions. To avoid this unusual combustion and decrease NOx, the effect of ignition timing delay and exhaust gas recirculation were studied. Hydrogen fuel was continuously injected at 28 mm pressure through a pressure reduction valve. The exhaust gas sample was taken through an air bag into a glass bottle and determined by the electric resistance of an electrolyte which is changed by the partial pressure of NOx. The NOx concentration was reduced by delaying ignition, but whenever unusual combustion started, NOx increased. Recirculation of exhaust did not affect the NOx concentration.

29159 **APTIC NO. 51688**

Galeano, Sergio F. and K. Magnus Leopold

A SURVEY OF EMISSIONS OF NITROGEN OXIDES IN THE PULP MILL. *TAPPI, 56(3):74-76, March 1973. 7 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Environmental Conference, Houston, Tex., May 14-18, 1972.)*

The amount and characteristics of nitrogen oxide emissions from typical pulp mill installations such as recovery furnaces, lime kilns, sulfiting towers, and bark boilers were investigated. The analytical method and procedure, sampling technique, and survey results are reviewed. Operating conditions were also studied. The NOx emissions from typical unit operations were well below comparable combustion units and were negligible with respect to contributions to air pollution. (Author conclusions modified)

29160 **APTIC NO. 51102**

Gerhards, K.

PLASTIC SCRAP IN TRASH AND ITS EMISSIONS FROM TRASH INCINERATORS. INVESTIGATIONS AND TENDENCIES IN DEVELOPMENT. *(Kunststoffabfaelle im Muell und ihre Emissionen aus Muellverbrennungsanlagen. Untersuchungen und Entwicklungstendenzen). Preprint, 1973. 4 refs. (Presented at the Refuse Meeting, 24th, Stuttgart, West Germany, March 8, 1973.) Translated from German, 14p.*

The weight, type, and proportion of plastics in house trash are determined to study the contribution of plastics in refuse to emissions from incinerators. Based on 1971 data, plastics contents of trash and subsequent emissions are predicted for 1980. The major plastic components are polyolefins, polyvinylchlorides, and polystyrenes. Plastics combustion contribution to nitrogen oxide, sulfur, and fluorine compound emissions is negligible. The major pollutant related to plastics incineration is hydrogen chloride.

29161 **APTIC NO. 51444**

Habibi, Kamran

CHARACTERIZATION OF PARTICULATE MATTER IN VEHICLE EXHAUST. *Environ. Sci. Technol., 7(3):223-234, March 1973. 19 refs. (Presented at the California Institute of Technology, Symposium on Science in the Control of Smog, Pasadena, Calif., Nov. 15-16, 1971.)*

Measurement methods for the characterization of particulate matter emitted in engine exhausts are reviewed. The particulates are composed primarily of lead salts, iron as rust, base metals, soot, carbonaceous material, and tars. The lead content of the particulate emission was examined with respect to particle size, effects of fuel composition, effects of operating mode on lead emissions, emission rates, and atmospheric interactions. A proportional sampling system for exhaust particulate matter, using a dynamometer and sampling probe, is described. The effects of particulate emissions on visibility (light scattering) and soiling were also studied.

29162 **APTIC NO. 51135**

Haese, U.

IRAN GATCH 1000 TONS/DAY GYPSUM PLANT WITH NOVEL KILN INSTALLATION, NEAR TEHERAN. *(1000 t/d-Gipswerk Iran Gatch bei Teheran mit neurtiger Ofenanlage). Text in German. Zement-Kalk-Gips (Wiesbaden), 26(5):209-214, May 1973.*

All facilities for the new gypsum plant Iron Gatch near Teheran are accommodated in a building with a length of 110 m and a width of 17 m plus 30 m for cyclones for dust collection. The maximum height of the building is 28 m. Construction of the plant began in Dec. 1971. The theoretical capacity of the plant of 1000 tons/day was exceeded by 50 tons in a 72-hour test run. The furnaces in the gypsum plant are equipped with hot gas generators which are operated with heavy fuel oil or natural gas. The hot gas temperature at the furnace entrance is 500 to a maximum of 700 C. The waste gas temperature is between 130 and 190 C. The waste gas is liberated of the dust in a series of cyclones and then discharged into the atmosphere. About 133,000 cu m/hr of waste gas develops.

29163 **APTIC NO. 51391**

Hijikata, Kazuo

SOME POINTERS FOR THE POLLUTION CONTROL MEASURES AT PAINT FACTORIES. *(Toso kojo no kogai taisaku no pointo). Text in Japanese. Toso to Toryo (Finish Paint), no. 222:55-66, 1973.*

Fuel oil combustion throughout Japan in 1967 created 870,000 tons of carbon monoxide, 60,000 tons of nitrogen oxides, 180,000 tons of hydrocarbons, and 10,000 tons of sulfur oxides, of which, 99.7%, 35.9%, 97.9%, and 1.0%, respectively, were emitted by automobiles. The total annual cost to all families specifically caused by air pollution in 1971 was approximately $167,190,000, and the public nuisance control budget was $56.6 per capita. Pollutants from paint factories are solvents used for diluting paint, solvent mist, which evaporates from painting process, and dusts created by the powder paint process. Organic solvents and poisoning symptoms are presented in a table. Acetylene tetrachloride causes liver, stomach, and nerve damage; carbon tetrachloride causes headaches, dizziness, diarrhea, skin inflammation; and benzene causes anemia, numbness, and loss of leukocytes and erythrocytes. Symptoms caused by the class II organic solvents such as acetone, xylene, acetic acid amil, ethyl, propyl, butyl, methyl, toluene, and methanol, are irritation of the eye, skin, respiratory passages, and mucous membranes, headaches, anemia, dizziness, coughs, breathing difficulties, nausea, tears, liver and kidney ailments, palpitations, vomiting, loss of sight, and many others. The control method for primarily waste liquid is presented by diagrams and the cost analysis is presented.

29164 **APTIC NO. 51134**

Hoch, Klaus

EVAPORATION AND COMBUSTION OF SULFITE WASTE LYES. *(Eindampfung und Verbrennung von Sulfitablaugen). Text in German. Muench. Beitr. Abwasser-, Fischerei- Flussbiol., no.22:250-262, 1973. 7 refs.*

For the combustion of sulfite waste lye which has heating values between 1400 and 1900 kcal/kg and a concentration of 55% dry substance, special combustion chambers have been developed. The Lodby muffel, Steinmueller-Lurgi combustion chamber, and the Copeland fluidized bed reactor are illustrated and briefly described. With the incineration of calcium bisulfite lye only the problem of ash disposal remains. At the combustion of magnesium spent liquor, magnesium sulfite or bisulfite is converted into magnesium oxide, sulfur dioxide, and oxygen. This reaction offers the basis for a recovery process which is discussed in greater detail. The particulate MgO developing at the combustion is separated from the flue gas along with the also present SO2 in a centrifugal collector. The MgO is scrubbed with water for removal of soluble organic pollutants. Subsequently the magnesium oxide is hydrated to magnesium hydroxide at 90 C. The flue gas which now contains only very little dust is scrubbed in venturi scrubbers with a monosulfite containing solution. The SO2 reacts with monosulfite and bisulfite develops. Next magnesium hydroxide is injected which reacts with the bisulfite. The scrubbing fluid is used as a boiling agent. The losses of magnesium of the spent liquor-boiling fluid cycle are replaced by the addition of magnesium oxide. Contrary to the described method (Babcock method), the Lenzing method cleans the flue gases from dust by a wet method which at the same time cools the gases. The sodium sulfite spent lye regeneration is explained by the SCA-Billerud method. As far as the evaporation is concerned, the multi-stage vacuum evaporation is discussed in greater detail.

29165 **APTIC NO. 51416**

Hogan, Robert C.

CONVERTING COAL-FIRED BOILERS TO NATURAL GAS OR LOW-SULPHUR FUELS. *Preprint, 5p., March 1973. (Presented at the National Plant Engineering and Maintenance Conference, 24th, Chicago, Ill., March 12-15, 1973, Paper 16.)*

The conversion of coal-fired boilers to natural gas or low-sulfur fuels is described. Engineering studies made of the problems are reviewed, and a discussion on burner selection, combustion control, boiler panel instrumentation, the continuity of operation, and costs is presented. Boiler efficiency after the conversion is considered.

29166 **APTIC NO. 51188**

Jockel, Heinz and Bruno E. Triebskorn

GASYNTHAN PROCESS FOR SNG. *Hydrocarbon Process., 52(1):93-98, Jan. 1973. 8 refs.*

The GASYNTHAN process was developed for the manufacturing of synthetic natural gas. The plant incorporates naphtha desulfurization, naphtha catalytic reforming with steam to methane-rich gas, methanation of rich gas hydrogen and carbon dioxide, and removal of CO2 to meet desired gas quality. The process routes, design, operating variables, and production are reviewed.

29167 **APTIC NO. 51138**

Kawaguchi, Masayuki, Tadakazu Tsurudo, and Yukio Sato

DEVELOPMENT OF LOW EXHAUST EMISSION GAS TURBINE COMBUSTORS BURNING LIGHT/HEAVY FUELS. *(Ju-keiyu nensho gasu tabin no tei kogai nenshoki no kaihatsu). Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind., Tech. Rev.), 10(1), Jan. 1973. 10 refs.*

Analysis of smoke and nitrogen oxides emissions caused by a gas turbine combustion chamber and low exhaust emission gas turbine combustors is described. Experiments were done on a test rig under semi-pressurized conditions in order to improve the smoke level (visibility and carbon concentration) and to reduce nitrogen oxides emission. As the result, a low emission combustor with no pressure drop increase and no decline in combustion efficiency and temperature distribution at its exit was developed. Exhaust gas smoke emission can be effectively reduced by paying attention to air/fuel mixing in the primary zone and by maintaining a constant fuel spray cone angle, coping with pressure ratio increases. The latter can be accomplished by the suitable combination of a swirler and some scoops on the side wall of the side wall of the combustor. Visibility of smoke arising from the firing of heavy oil containing a small quantity of residual carbon can also be reduced by a smokeless swirler combustor. A smokeless type short flame swirler combustor can reduce nitrogen oxides emissions. Thus, the reduction of NOx and the lowering of smoke level were attained simultaneously. The ignition and combustion stability problems can be solved by applying a specially designed swirler with an inner baffle. A steam injection swirler and water mixed fuel combustion system provide an additional control of smoke and NOx level for the use of heavier distillate fuel and higher pressure ratio gas turbine.

29168 **APTIC NO. 51377**

Kerl, Max

NATURAL OIL - DRILLING, PROCESSING AND ECONOMIC IMPORTANCE. *(Erdoel - Gewinnung, Verabeitung und wirtschaftliche Bedeutung). Text in German. Chemiker-Ztg. (Heidelberg), 97(6):296-303, 1973.*

The origin, exploration, production, transportation, and chemistry of petroleum and its products are described. The basic process steps for the manufacture of primary petroleum products are outlined and refinery flow sheets are presented. A special isomerization process has been developed which converts paraffins into isoparaffins in presence of hydrogen and through the use of precious metal catalysts. Isoparaffins have better anti-knocking properties which is important in connection with the reduction of the lead level in gasolines. The construction of such a plant is similar to a reformer but with only one reactor. The conversion in one step is not enough for a considerable increase of the octane number. A separation of isoparaffins and paraffins after the reaction is necessary. Molecular sieves are used for this. The paraffins are returned to the reactor.

29169 **APTIC NO. 51121**

Knizia, K.

ENERGY CONVERSION FROM FOSSIL AND NUCLEAR FUELS IN POWER PLANTS - STATE OF THE ART AND DEVELOPMENT TRENDS. *(Energieumwandlung aus fossilen und nuklearen Brennstoffen in Kraftwerken - Stand und Entwicklungstendenzen). Text in German. VGB Kraftwerkstechnik, 53(5):277-283, May 1973.*

Presently 1/4 of the primary energy consumed in the Federal Republic of Germany is used in power plants for power production. By the year 2000 it will be more than 50%. At present and to the end of this decade power will be mainly produced in fossil fuel heated plants. With respect to environmental pollution, the main concern in this period will be the reduction of the dust, carbon dioxide, the oxides of nitrogen, and sulfur dioxide emissions. The portion of power produced in nuclear power plants will rise. Those plants still operating with fossil fuels will be connected with fuel or flue gas cleaning systems. This will mainly help to reduce the sulfur dioxide emission. The emission of nitric oxide will be reduced by development of better combustion techniques. Only carbon dioxide will still be emitted. In the next century power will be exclusively produced in nuclear power plants along with hydrogen which will increasingly be used for combustion. Since the combustion of hydrogen produces only water as a side-product, a good deal less CO2 will be emitted into the atmosphere.

29170 **APTIC NO. 51699**

Lewis, Clifford

WATER POLLUTION PROBLEMS ASSOCIATED WITH CONTROL OF STACK GAS EMISSION. *Ind. Wastes, 19(1):19-21, Jan./Feb. 1973. 3 refs. (Presented at the Annual Purdue Industrial Waste Conference, 27th, Purdue University, Lafayette, Ind., May 2-4, 1972.)*

Water pollution problems associated with control of stack gas emissions are discussed. Various sources of stack gas emissions were reviewed, including: sawdust burners, chemical manufacturing operations, copper smelting, and coal burning power plants. Technologies used to scrub stack gases clean are reviewed, and the resultant problems of water pollution are considered.

29171 **APTIC NO. 51295**

Luebs, R. E., A. E. Laag, and K. R. Davis

AMMONIA AND RELATED GASES EMANATING FROM A LARGE DAIRY AREA. *Calif. Agr., 27(2):10-12, Feb. 1973.*

The volatilization of nitrogen in combined form, principally as ammonia, from animal wastes was examined. The air quality around dairies was measured to determine the contribution of these nitrogen compounds to atmospheric pollution. Concentrations of ammonia and amines were 20-40 times higher in the air of the dairy area than in the urban areas 7 mi upwind from the boundary of the dairy. The measurement data were correlated with data on enrichment of the atmosphere and absorption in acid-surface traps. The area over which the atmosphere was enriched totalled 224 sq mi, i.e., 3.7 times greater than the area where the dairies were concentrated.

29172 **APTIC NO. 51041**

McAlevy, Robert F., III and Richard B. Cole

NITRIC-OXIDE MEASUREMENT IN A SIMULATED SPARK-IGNITION ENGINE. *Stevens Inst. of Tech., Hoboken, N. J., Dept. of Mechanical Engineering, Environment Protection Agency Grant R-801874, TR-ME-RT 73001, APTD-1498, 74p., Jan. 1973. 30 refs.*

NTIS: PB 220174

A mechanical analog for the spark-ignition was designed, instrumented, and tested to facilitate controlled, reproducible, testing for nitric oxide generation. The analog provides for constant-volume combustion followed by product-gas expansion through a cam-driven poppet valve, giving pressure-time histories like those of spark-ignition engines. Measurements of NO concentrations in the product gas were made several seconds after combustion both with and without product-gas expansion. The NO concentrations were independent of the rate at which product gases were expanded. Efforts to measure NO concentrations during constant-volume combustion were impeded by unanticipated strong background absorption by carbon dioxide. This rendered the combustion chamber opaque during combustion and precluded monitoring of NO absorption. (Author abstract modified)

29173 **APTIC NO. 51193**

Morse, Park L.

QUICKER METHANE REFORMING DESIGN. *Hydrocarbon Process., 52(1):113-116, Jan. 1973. 6 refs.*

Equations are presented for calculating directly, the operating conditions and effluent compositions for steam reforming of methane. One advantage of the methods is that design computations can be carried out with a desk calculator or computer. A second advantage is the use of the hydrogen/carbon monoxide molar ratio in the reformer effluent as an independent design variable that is fixed in advance of the calculations. The method is primarily applicable to the preparation of synthesis gas for methanol and oxo alcohol manufacture, but it can be used for other types of steam-methane reforming provided oxygen is not a reactant.

29174 **APTIC NO. 51122**

Neikes, Joerg

CITY PORTRAIT: DUISBURG. ON FIFTY DAYS SMOG DANGER. *(Staedteportraet: Duisburg. An 50 Tagen Smoggefahr). Text in German. Umwelt (Duesseldorf), (3):28-31, 1973.*

In the city of Duisburg, industry is densely represented. Of the 89 blast furnaces in the Federal Republic of Germany, 30 are in Duisburg, 46.3% of the crude iron is produced there, and 39.9% of the crude steel. In some districts of Duisburg, sulfur dioxide concentrations of 0.6 mg/cu m were measured. Through the installation of filters, the visible dust could be eliminated, but the quantity of respirable dust rose. Many residents left the city. The northern section of the city is more heavily polluted than the south. Private measurements with official measuring units revealed SO2 concentrations of 2 mg SO2/cu m which is above the tolerance limit. On the average, Duisburg has temperature inversions on 50 days of the year. Not enough measuring units are available in the city for monitoring the SO2 level, those which are available are set at less polluted points. Of the 1000 species of moss growing in the Federal Republic of Germany, 650 grow in North Rhine Westfalia. In Duisburg only 225 still grow.

29175 **APTIC NO. 51133**

Otto, J.

GRAVIMETRIC MEASUREMENTS OF THE DUST QUANTITY DEVELOPING DURING THE POLISHING OF EXOTIC VENEER. *(Gravimetrische Messungen des Staubanfalls beim Schleifen exotischer Furnierhoelzer) Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin) 19(4):266-269, 1973. 10 refs.*

In 27 wood working enterprises, the dust developed during the polishing of exotic veneer was measured by the gravimetric method. With the aid of a vacuum pump air samples were drawn through membrane filters. No preliminary separation took place. Critical nozzles were used for dosage of the air quantity. The sampling speeds ranged from 216 to 556 l/hr. The sampling times lasted from 30 to 70 min. Prior to absorption the membrane filters were dried and accurately weighed immediately after sampling and for a second time after 1 hr of drying at 100 C. The dust concentrations fluctuated within a wide range from 2.0 to 151.0 mg/cu m; 38.3% of the measured values were 20 mg/cu m and higher; 24.5% were between 10 and 19 mg/cu m; 23.5% were between 5 and 9 mg/cu m; and 13.7% of the measured values were below 5 mg/cu m. The veneer dusts examined may cause asthmatic symptoms through the albumins and amino acids. In one veneer sample, nine different glycosides were found. About 90% of the dust particles were smaller than 5 micron.

29176 **APTIC NO. 51315**

Pichler, Helmut and Theodor Heike

NATURAL GAS - IMPORTANCE AS ENERGY SOURCE AND RAW MATERIAL. *(Erdgas - Bedeutung als Energietraeger und als Rohstoff). Text in German. Chemiker-Ztg. (Heidelberg), 97(6):289-296, 1973. 9 refs.*

Natural gas resources are used as a source of energy and in the chemical and ore industry. Natural gas competes with naphtha, liquefied petroleum gas, and other low-boiling petroleum products in the chemical industry. Natural gas can be used as a raw material for a number of products. Depending on its use, natural gas sometimes must be pretreated or interfering impurities removed. Natural gas for the reduction of iron ore competes with coke and fuel oil. Natural gas is of special interest to countries with iron deposits and natural gas resources, but no coal deposits. The composition of natural gas varies widely. Apart from methane it contains concentrations of carbon dioxide between 0.1 and 20%, nitrogen between 1 and 50%, and hydrogen sulfide between 0-30%. For its use as a fuel, the concentration of corroding substances is low enough to cause no major difficulty. For its use in the chemical industry the sulfur compounds must be removed because they spoil the catalysts and corrode apparatuses. They are removed by chemical or chemical-physical scrubbing processes and are processed to either elemental sulfur (Claus process) or to sulfuric acid and inorganic or organic sulfur compounds.

29177 **APTIC NO. 51200**

Ploetz, Th.

ENVIRONMENTAL BURDEN BY THE PULP AND PAPER INDUSTRY. *(Umweltbelastung durch die Zellstoff- und Papierindustrie). Text in German. Papier Darmstadt, 27(5):181-187, 1973.*

The effluent load and the technological and financial expenditure for its decrease are discussed for the pulp and paper industry. Trends and a cost-effect comparison and a survey on cost division between industry and public institutions are discussed for various countries. The pulp and paper industry emits gaseous sulfur compounds which amount to about 1/3 of the total sulfur losses of the process. The immediate neighborhood is plagued by odors. In plants operating by the calcium bisulfite process, the water pollution problem is converted into an air pollution problem because high amounts of sulfur dioxide are emitted through the combustion of waste lye. Many such plants are confronted with two alternatives to switch to soluble bases (magnesium, ammonia, or sodium), with recovery of the chemicals or to close down. Forecasts by the United States and Canada indicate that by 1975 no such plant will be in operation any longer. Sweden wants to arrive at this goal by 1980.

29178 **APTIC NO. 51505**

Pueschel, Rudolf F. and Gerhard Langer

SUGAR CANE FIRES AS A SOURCE OF ICE NUCLEI IN HAWAII. *J. Appl. Meteorol. 12(3):549-551, April 1973. 9 refs.*

A review of various studies on the subject of sugar fires as a source of ice nuclei in Hawaii is presented. Air sampling flights during May and June, 1972, showed ice nucleus concentrations to be between 0.3 and 1.0/l at -20 C when membrane filters were partially exposed to the narrow smoke plumes between 100 and 300 m altitude. Soil samples from Hawaii and Colorado were sent separately into a particle counter. The samples of Hawaiian soil showed ten times higher ice nuclei content. The continuous accumulation of ash particles makes the Hawaiian soil rich in ice nuclei. Cane leaves ripe for, harvesting were burned in the laboratory and the smoke was aspirated through counter at -21 C. The leaves were supported so that the basic leaf structure remained intact during combustion. The count from the smoke alone was relatively low, but as soon as the ash skeleton disintegrated to produce a fine dust, the counts increased by an order of magnitude. This suggests that the noncombustible inorganic content of the leaves, rich in copper and zinc, provide the material that is active in ice forming nuclei. The ice nucleus counts downwind from sugar cane fires are compared to other potential sources of nuclei on the island of Hawaii. Sugar cane fires are the most prolific single source of ice nuclei on the island of Hawaii.

29179 **APTIC NO. 51545**

Rytvinskiy, G. N. and I. Ya. Raykov

COMPARATIVE ANALYSIS OF EXHAUST AND CRANKCASE GASES. *(Sravnitelnyy analiz sostava otrabotavshikh i karternykh gazov). Text in Russian. Avtomob. Prom., no. 4:8-10, 1973. 6 refs.*

A comparative study of the composition of crankcase and exhaust gases generated by gasoline and diesel engines, as influenced by operating conditions, was performed. Crankcase gases contained 40% of the combustion products. Crankcase gases contained at least 10 times more aldehydes than exhaust gases, which indicated that formation of aldehydes predominantly occurred in the relatively cold chamber wall layer during the late stage of the combustion process. The crankcase gas aldehyde content from gasoline engines and from MAN type diesel engines, measured under medium load conditions, were 0.03-0.07 mg/l and 0.02-0.03 mg/l. The crankcase gas aldehyde content was highest at small and high loads. The small amount of nitrogen oxides in crankcase gas indicated that nitrogen oxides were formed before completion of the active combustion process. The nitrogen oxide emission had its maximum within an air excess coefficient range of 0.9-1.1. The rate of nitrogen oxide formation was dependent on combustion temperature, the rate of heat generation, and the intensity of heat transfer from the focus of combustion. Uniform rate of formation of carbon monoxide in space and time was determined. Crankcase gases contained up to three times more CO than exhaust gases at high loads, which is indicative of the complete combustion of hydrocarbons in the chamber wall layer. Crankcase and exhaust gases contained about the same amount of CO at small loads.

29180 **APTIC NO. 51117**

Salomon, Herbert

THE THERMAL DESTRUCTION OF HIGHLY LOADED PRODUCTION WASTE WATER IN THE CHEMICAL INDUSTRY. *(Die thermische Vernichtung hochbelasteter Produktionsabwaesser in der chemischen Industrie). Text in German. Muench. Beitr. Abwasser-, Fischerei- Flussbiol., no. 22:238-248, 1973.*

For the disposal of a salt-free waste water from the chemical industry, a thermal method was developed which is technically and economically superior to biological purification. Depending on the available fuel (gas or fuel oil), various incinerators are feasible. The waste water can be entered as liquid or in vaporous form. In the first large-scale incinerator constructed for this purpose, heavy fuel oil and an off-steam of about 1 atm gauge is used. The waste water is evaporated to a large extent with waste heat steam and mixed with flue gases produced with heavy fuel oil and a sufficient amount of oxygen to provide a surplus. After incineration, the waste water vapor has a temperature of 700 to 730 C. The heat is utilized in a waste heat boiler where steam with 8 atm gauge is produced. Gas chromatographic analyses of the off-gas revealed that the combustion of the organic components is nearly complete. Only acetic acid remains in the waste gas of all organic pollutants. No soot forms during the incineration process. Based on a B.O.D. value of 90,000 mg 02/l, the combustion costs for 1 kg B.O.D. were calculated to amount to about 10 cents. These costs do not include the steam consumption for waste water evaporation and for steam production.

29181 **APTIC NO. 51541**

Sampson, Robert E, and George S. Springer

EFFECTS OF EXHAUST GAS TEMPERATURE AND FUEL COMPOSITION OF PARTICULATE EMISSION FROM SPARK IGNITION ENGINES. *Environ. Sci. Technol., 7(1):55-60, Jan. 1973. 17 refs.*

The effects of exhaust gas temperature and fuel composition on particulate emissions from spark ignition engines were investigated. An experimental apparatus was built to collect particles directly from the exhaust of a spark ignition engine mounted on a dynamometer test stand. Three different sampling systems, consisting of filters and an Andersen stack sampler, were constructed. The performances of these systems were evaluated, and the conditions necessary for obtaining representative samples of the exhaust stream were established. The total weight and the size distributions of particles emitted from a 1970 Chevrolet 350-in. V-8 engine were measured over a wide range of exhaust gas temperatures (85 to 820 deg F). The experiments were performed with both leaded and unleaded fuels at a steady engine speed and constant road condition. The weight of the particles deposited along the inside wall of the exhaust gas system was also determined. The resulting particle emission concentrations during steady and cyclic operating conditions are listed and also discussed. (Author abstract modified)

29182 **APTIC NO. 51137**

Schulze, Ernst

THE GLASS CONTAINER INDUSTRY IN THE FUTURE: MARKETING, TECHNICAL ECONOMIC AND POLITICAL ASPECTS. *(Die Hohlglasindustrie der Zukunft unter marktmaessigen, technischen und gesellschaftspolitischen Aspekten). Text in German. Glastech. Ber., 46(5):71-83, May 1973. (Presented at the Glastechnischen Tagung, Wiesbaden, West Germany, July 5, 1972.)*

The development of the container industry is considered, and market trends, structural changes in wares, packaging, production methods, and economics are discussed. Each industry has to cope with the problems of environmental pollution. The glass industry has eliminated, to a large extent, the fluorine components from its emissions. Further reductions of the emission were achieved through improved trough construction, reduced flow speeds, reduced use of fuels, and increased use of electricity, use of pelletted and granulated raw products, and addition of sodium lye for the maintenance of a residual moisture for transport. About 75% of the produced glass containers are no return bottles. They pose no problems with any of the waste disposal methods from the sanitary landfill and incineration to composting.

29183 **APTIC NO. 51351**

Sisson, William

DETERMINING COMBUSTION EFFICIENCY. *Plant Eng., 27(10):117, May 17, 1973.*

The combustion efficiency of a boiler is affected by the quantity of combustion air and the carbon/hydrogen (C/H) ratio of the fuel. Any change of the C/H ratio directly affects the quantity of air required for the complete combustion of the fuel. Using an Orsat analysis of the flue gas, the theoretical maximum output of carbon dioxide and the C/H ratio of the fuel can be determined from derived formulas. The mathematical procedures for the determination of combustion efficiency are examined.

29184 **APTIC NO. 51415**

Suchsland, Dean

DISPOSITION OF SOLIDS BY EVAPORATION AND INCINERATION. *Preprint, 5p., March 1973. (Presented at the National Plant Engineering and Maintenance Conference, 24th, Chicago, Ill., March 12-15, 1973, Paper 20a.)*

The disposal of coffee liquor waste, acidic with a pH of 4.0 and containing 1% solids was investigated. Laboratory, pilot plant, and field studies were done to determine the best disposal method. The following approaches to the problem were considered: removal by evaporation and incineration, biological treatment with chlorination, reverse osmosis, and chemical oxidation. Concentration of the solids by evaporation was the most effective method in the laboratory tests; pilot plant studies were initiated to further study this method. Fumes were given off, however. A combination evaporation and incineration system was considered for the disposal of spent coffee grounds. Equipment selection (boilers and evaporators), operating variables, and capital and operating costs for the dual system are discussed. Later modifications of the system are described. The combined system net performance standards with soot blowing and furnace cleaning.

29185 **APTIC NO. 51593**

Takahashi, Yukio and Tomihisa Ishikawa

PLASTIC WASTE INCINERATION SYSTEM. *(Purasuchikku kanryu shokyaku shisutemu). Text in Japanese. Hitachi Hyoron, 55(3):95-98, March 1973. 2 refs.*

A bench scale model of a dry distillation incineration system for plastic waste was designed. The system has a pretreatment process for plastic containing hydrogen chloride. Using the thermal property of polyolefin in the absence of oxygen, polyvinyl chloride (PVC) is distillated at 280-400 C and dehydrochlorinated. The pretreatment compartment is heated indirectly from the outside of the wall and directly by steam. Experiments with the dry distillation temperature showed that at 300 C, only 54.2% dehydrochlorination was achieved, and at 350 C, 98.5% of PVC was dehydrochlorinated. The gas produced by this process contains hydrocarbons and hydrogen cyanide. The gas is heat exchanged in the boiler, and part of it is recirculated by a circulation blower to the outer channel of the pretreatment kiln. The rest of the gas is cooled in the scrub tower, and the dust in the gas is eliminated. The traceable amount of HCl and other toxic gases are absorbed in alkaline liquid. Only HCl is absorbed in water and recovered as chlorine. Most of HCl gas from the distillation process is sent to an incinerator, and combustibles in the gas are burned. The residue plastic is incinerated by supplying combustion air in several sections until it is completely burned. The ashes contain lead, cadmium, and other heavy metals, and require an appropriate solid treatment system.

29186 **APTIC NO. 51402**

Umezawa, Yasuo

PAINT AND ODOR. *(Toryo to nioi). Text in Japanese. Toso to Toryo (Finish Paint), no. 222:44-42, 1973. 13 refs.*

The nature of odors, classifications, chemical structures, measurement methods, and countermeasures for odors are discussed. Odors created by paints and coating material are discussed. The measuring methods reviewed are sensitivity test methods such as the odorless chamber method, air dilution method, and the Shuken Kinoshita method; and equipment methods such as the Kitagawa detector and gas chromatography. The control methods include the combustion method (by an afterburner), the catalytic oxidation method, adsorption methods, absorption methods, condensation methods, and the atmospheric diffusion method. The structures of the paint surface films are different depending on the paint type such as the solvent evaporation type, shrinking type, and polymerization type. Odor is created by solvent evaporation or chemical reaction. Hardening agents such as epoxy resin amines also create odor. The odor of paints can be controlled by replacing organic solvents with nonsoluble paint, or nonphotochemical reaction solvent, or by using an exhaust emission treatment apparatus, the new electronic ray hardening method, or the photoset method. The use of low odor acid hardening amino alkyd resin paint shows a considerable decrease of odor compared to the use of ordinary amino alkyd resin paint.

29187 **APTIC NO. 51282**

Wood, R.

FLUORINE AS A POLLUTANT. 8. *Trans. Brit. Ceram. Soc., 72(1):35- 37, Jan. 1973. 11 refs.*

Fluorine as a contaminant in the environment, as well as the beneficial effects of this element to man, are described. Sources of fluorine contamination such as steelmaking, metal alloy production, brick, tile, and ceramic industries, aluminum production, phosphate fertilizer industry, phosphoric acid production, cement industry, and burning coal are discussed. A variety of other minor possible sources of airborne fluorine contaminants are described. A panel of the American Association for the Advancement of Science placed fluorine as the third in a list of five pollutants. Gaseous hydrofluoric acid and silicon tetrafluoride are the main fluorine compounds in polluted atmospheres which damage plants. Fluorosis in animal and humans is discussed. Legislation and standards in the United Kingdom are mentioned. The threshold limit values for hydrofluoric acid and inorganic fluoride are 2 and 2.5 milligram/cu m, respectively. A sampling procedure has been developed, based on the use of a membrane filter to collect particulate, and an alkali-impregnated paper to trap gaseous, fluoride.

29188 **APTIC NO. 51394**

Yoshida, Eiichi

AUTOMOTIVE FUEL IN THE FUTURE. *(Kongo no jidosha nenryo ni tsuite). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(4):325-330, April 1973. 34 refs.*

The quality of automotive fuel required to meet new exhaust control standards is discussed. Changes in fuel properties affect the performance of the exhaust gas cleaning equipment. Carbon monoxide is unaffected by the hydrocarbon composition of gasoline, but nitrogen oxides increase with greater aromatic content in the fuel. The fuel composition has little effect on total HC emission, but affects the composition of the HC in the exhaust gases. Emission of aromatic hydrocarbons increases with increased aromatics in the fuel, but emissions of olefins decreases. The olefin content of the fuel has no significant effect on HC composition of the exhaust. The HC emission that can be attributed to the fuel composition decreases with the reduction of the total HC emission achieved by advanced exhaust gas cleaning devices. Thus, the effect of fuel composition on HC will become more limited when the cleaners are improved. Photochemical reactivity of HC from the exhaust is not affected by fuel composition. A 10% increase in fuel aromatic content causes little or no effect on photochemical reactivity. Votality of gasoline fuel and fuel additive effects are also discussed. Light diesel fuel is also discussed. Substitute fuels for automobiles include liquefied petroleum gas, natural gas, methanol, and hydrogen.

29189 **APTIC NO. 51513**

Yoshizumi, Kunio, Yasuo Iida, Koichi Inoue, Kimio Kubota, and Toshio Odaira

THE COMPOSITION OF CAR EXHAUST GAS. *(Jidosha haikigasu sosei). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 4:85-94, March 1973. 13 refs.*

The effects of driving conditions and fuels on the composition of automobile exhaust gas were studied with a test car run on a dynamometer. Regular, premium, three nonlead, and four lead-containing gasolines were tested. Carbon monoxide, carbon dioxide, hydrocarbons, nitric oxide, nitrogen dioxide, and oxygen were measured continuously. Results were analyzed by a computer. Regular gasoline caused high CO and HC concentrations at idling; the concentrations decreased when car speed increased. At 40 km/hr, the CO2 concentration was 1/10th the amount at idling. It was also a minimum from 40 to 60 km/hr. As car speed increased over 60 km/hr, CO increased.

1972

29190 **APTIC NO. 51058**

Japan Public Health Assoc., Itai-itai Disease Investigation Group

STUDIES ON THE CAUSE OF ITAI-ITAI DISEASE -- PARTICULARLY ON THE SOURCE AND DISTRIBUTION OF HEAVY METALS WITH EMPHASIS ON CADMIUM. *(Itai-itaibyo no gen in ni kansuru kenkyu -- tokuni Kadomyumu o chushin to suru jukinzokurui no bunpu to sono yurai ni tsuite). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 121-124, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 6p.*

Studies were done to determine the source and distribution of heavy metals including cadmium in the Jinzu River Basin, the nosogenetic area of Itai-itai disease. Samples were collected of zinc, lead, and cadmium for chemical analysis, and the river basin was examined for its geological features. Cadmium, zinc, and lead are distributed widely in soils of the rice fields which are irrigated with the main flow of the Jinzu River, and their concentrations were higher than those in soils irrigated by neighboring rivers. Examinations of the Jinzu River water systems revealed a highly concentrated distribution of these metals near smelters refineries, which discharge drainage and wastes into the Jinzu River.

29191 **APTIC NO. 51071**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Bureau

OPINION OF THE WELFARE MINISTRY WITH REGARD TO ENVIRONMENTAL POLLUTION BY CADMIUM IN THE ENVIRONS OF AIZU SMELTING WORKS OF NISSO KINZOKU CO., LTD., AT BANDAI TOWN IN FUKUSHIMA PREFECTURE AND COUNTERMEASURES TO BE TAKEN. *(Fukushima-ken Bandai-cho nisso kinzoku kankyo kabushiki-gaisha Aizu seirensho shuhen ni okeru kadomyumu kankyo osen ni kansuru koseisho kenkai to kongo no taisaku). Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 263-282, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 39p.*

The policy of the Japanese Ministry of Welfare in regard to environmental pollution by cadmium in the vicinity of smelting works in Fukushima Prefecture is presented. A field survey was done of the area to determine the extent of pollution and its sources. Cadmium content in exhaust smoke and dust including soot was 0.107-1.037 mg/cu m in the area of the smelting works. Measurements were also taken of cadmium concentration in drainage, river water, drinking water, rice held in stock, and in soil. The inhabitants were examined to determine any health effects of cadmium, and these results were compared with those for inhabitants in other areas. Control methods suggested included: reinvestigation of cadmium concentration in air, continuing health examinations of the inhabitants, reduction of operation in the smelting plant to 1/3 of full capacity, replacing raw ore by other ores containing less cadmium, improving ore storing and transporting methods, and a reduction in the amount of exhaust gas coming from the plant.

29192 **APTIC NO. 51072**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Dept.

OPINION OF THE WELFARE MINISTRY WITH REGARD TO ENVIRONMENTAL POLLUTION BY CADMIUM IN THE ENVIRONS OF THE MIKKAICHI SMELTING WORKS IN KUROBE CITY, TOYAMA PREFECTURE AND COUNTERMEASURES TO BE TAKEN. *(Toyama-ken Kurobe-shi Mikkaichi seirensho shuhen ni okeru kadomyumu kankyo osen ni kansuru koseisho no kenkai to kongo no taisaku). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 195-218, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 41p.*

The policy of the Japanese Ministry of Welfare in regard to environmental pollution by cadmium in the vicinity of smelting works in Kurobe City is presented. Cadmium concentration in the atmosphere was 0.31 mg/cu m in the area. Cadmium concentrations were also measured in riverbed soil, in rice field soil, in rice, in discharge water, and in river water. The main source of cadmium was determined to be the scattering of dust during roasted zinc ore intake and the sintering process. Countermeasures suggested included prolonging continuous measurements, instituting a study of health effects on the inhabitants, strengthening measures for dust collection, establishment of an automatic meter for waste gases from the neutralization tower, and constructing a taller stack. Regulations should be revised to include an emission standards.

29193 **APTIC NO. 51199**

ROAD VEHICLE EMISSION TESTING: NEWCASTLE UPON TYNE. *Clean Air, 2(8):24-25, Winter 1972.*

Of 390 gasoline engine vehicles tested by non-dispersive infrared analysis in Newcastle upon Tyne on September 27-28, 1972, 144 were emitting 4.5% or less carbon monoxide of the total volume of exhaust gases. Of the vehicles which were registered after August 1, 1971, nearly twice as many emitted more than 4.5% CO as the number which emitted less. There was an equal spread of vehicles registered after August 1, 1972 both above and below the continental limit of 4.5%, with which new cars in Britain must comply by November 1973. Second tests following carburetor setting adjustments indicated great reductions in CO and hydrocarbon content of exhaust gases.

29194 **APTIC NO. 51343**

Barry, P. S. I. and G. F. Harrison

MOTOR GASOLINE, LEAD AND AIR POLLUTION. *Petrol. Rev., 26(310):311- 318, Oct. 1972. 29 refs. (Presented at the Oesterreishische Gesellschaft fuer Erdoelwissenschaften, Vienna, 1972.)*

The addition of lead compounds allowed the use of higher compression ratios and hence more efficient engines. In spite of the fact that lead compounds are such valuable refining adjuncts, legislation has been proposed or introduced in certain countries to reduce or to eliminate the use of lead in gasoline. The possible effect of lead on the control of gaseous exhaust emissions such as hydrocarbons, carbon monoxide, and oxides of nitrogen are investigated. The possible health hazards resulting from the lead presence in the air are discussed. The concentration of lead in the exhaust gas varies widely, being influenced by the speed and load of the engine and the age and general condition of the exhaust system. Lead in the exhaust occurs as the chloride, bromide, chlorobromide, and sulfate oxide and as complexes with ammonia and phosphorus forms. Lead attributable to emission and dispersal into general ambient air has no known harmful effect. The maximum allowable concentration of lead in air applicable to industrial situations is 150 micrograms/cu m. Lead emissions can be reduced considerably by the use of simple, inexpensive exhaust gas filters.

29195 **APTIC NO. 51274**

Bergman, P. D. and D. Bienstock

ECONOMICS OF MIXED POTASSIUM-CESIUM SEEDING OF AN MHD COMBUSTION PLASMA. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Energy Research Center, RI 7717, 18p., 1972. 12 refs.*

The high price of pollucite ore, its limited availability, and the need to provide stack removal of sulfur dioxide present formidable obstacles to the use of pure cesium as a seeding material in magnetohydrodynamics power generation. Cost estimates indicate that mixed potassium-cesium seeding is preferable to the use of either pure cesium or pure potassium. Cheaper electricity and higher opencycle MHD operating efficiencies result from the use of mixed seed. Savings of $3,000,000 per year in power costs for a 1000-MWE open-cycle MHD power plant are envisioned if the mixed seeding technique is adopted. (Author abstract modified)

29196 **APTIC NO. 51358**

Caporali, Giorgio

HOW MONTEDISON MAKES ACRYLO. *Hydrocarbon Process., 51(11):144-146, Nov. 1972. 4 refs.*

Manufacturing of acrylonitrile by catalytic reaction of propylene with ammonia and air is described. Raw materials and reaction conditions are presented. Large size fluid bed catalytic reactors are used. Acrylonitrile purification and waste treatment are discussed. Gaseous wastes consist of off-gases from the water absorber, and their residual content of nitriles. Hydrogen cyanide is less than 10 ppm due to careful design and operation of the absorber. These are discharged to the atmosphere through a stack of convenient height. Recovery of some heat has been considered by burning these off-gases in a boiler with conventional fuel.

29197 **APTIC NO. 51456**

Davis, Albert

INCINERATION OF LOW OXYGEN FUMES. *Pollut. Eng., 4(9):36, Dec. 1972.*

The problems involved in incineration of low oxygen fumes are discussed. In most industrial applications, the chemical concentration causing air pollution violation is low, thereby compounding an already difficult problem. The fumes can be incinerated, but it consumes a large amount of fuel. An incinerator designed to handle 10,000 scfm of fumes at 200 F and to operate at 1400 F will require a net heat input of 13.6 million Btu/hr, assuming that enough oxygen to insure complete combustion of the fuel and the contaminating chemicals. At 15% oxygen, the combustion reaction will still be slower than it would be if the oxygen were at the 21% level. This requires higher combustion chamber retention time and a more expensive piece of equipment. For the 3% net oxygen in the incinerator flue gas stream, the air augmented burner needs 240 scfm for a 10% fume stream and 2150 scfm for a 5% fume stream.

29198 **APTIC NO. 51683**

Dawson, Douglas G. and Martin E. Sorkin

PREFORMULATED BAND-PLY LUBRICANTS: AN AID TO TIREMAKING EFFICIENCY. *Rubber Age (New York), 104(12):52-54, Dec. 1972.*

Automatically dispersed band-ply lubricants based on silicone polymer formulations eliminate labor and handling problems in molding uncured tires, prolong bladder life, and improve the appearance of the inside tire surface. The newest of these tire processing aids are preformulated in a water base. Unlike naphtha-based lubricants, the water-based formulations are noncombustible, nonirritant, and do not contribute to air pollution.

29199 **APTIC NO. 51105**

Dumon, R.

POLLUTANTS OF THE FUTURE: NITROGEN OXIDES. *Preprint, Heurtey S. A., Paris (France), Dept. of Research and Development, June 1972. Translated from French, 18p.*

The contribution of nitrogen oxides to the air pollution problem is reviewed with respect to the formation of NOx in the atmosphere and industrial reactions, man-made sources of NOx pollution, their toxicity, measurement techniques, emission standards, and control methods. The major sources of nitrogen dioxide and nitric oxide emissions include automobiles (40%), electric power plants (23%), industrial furnaces (18%), the oil industry (10%), and domestic heating (8%). Nitrous oxide and NO are only slightly or not at all harmful; NO2 causes irritation of the respiratory system and the eyes and may be fatal. The major danger from NOx, however, is in combination with hydrocarbons resulting in the formation of toxic smogs. The measurement techniques include infrared spectrometry, flame or gas chromatography, and colorimetry. Control of NOx emissions with respect to industrial process modifications through firing method improvements and two-stage combustion, gas recycling, steam or water injection, fluidized bed combustion, special burner designs, fuel substitutions, thermal reduction, catalytic reduction, adsorption, and absorption was examined.

29200 **APTIC NO. 51327**

Fairbanks, John W. and Frederick H. Morse

PASSIVE SOLAR ARRAY ORIENTATION DEVICES FOR TERRESTRIAL APPLICATION. *Solar Energy, 14(1):67-79, Dec. 1972. 9 refs.*

A passive solar array orientation device, called a thermal heliotrope, is described, and several terrestrial applications are illustrated. The thermal heliotrope consists of a bimetallic helical coil that serves as the motor element, producing torque and angular displacement. A control mechanism in the form of one or more shades completes the basic device. In comparison with electromechanical tracking systems, the thermal heliotrope is electrically passive, has relatively few parts, and is low in cost. The operating principle and models built for space applications are described, and the design considerations for terrestrial heliotrope units are presented. The use of the thermal heliotrope for solar array orientation could significantly reduce array cost, thus increasing the competative economic posture of solar arrays for terrestrial applications. The thermal heliotrope modified for terrestrial use is readily adaptable to orient solar energy concentrators, such as furnace, and stills. (Author abstract)

29201 **APTIC NO. 51610**

Gross, G. P.

THIRD ANNUAL REPORT ON GASOLINE COMPOSITION AND VEHICLE EXHAUST GAS POLYNUCLEAR AROMATIC CONTENT. *Esso Research and Engineering Co., Linden, N. J., Products Research Div., Environmental Protection Agency Contract 68-04-0025, Coordinating Research Council CRC-APRAC Proj. CAPE-6-68, APTD-1560, 112p., July 30, 1972. 20 refs.*

NTIS: PB 218873

Vehicle emission control systems, fuel composition, and fuel derived engine deposits were studied as variables affecting the exhaust emissions of 11 species of polynuclear aromatics (PNA) and phenols. Effects of vehicle emission control systems, fuel composition, engine deposits, and engine malfunction on the exhaust emissions of PNA and phenols are described. Engine deposit condition, or the amount of previous emission testing since deposit formation, influenced PNA emission results. Engine malfunctions caused significant PNA increases. Exhaust PNA samples differed from fuel PNA samples, with exhaust samples relatively deficient in certain more reactive PNA species. More reactive PNA were partially lost in collecting exhaust samples. These loses (about 50% for benzo(a)pyrene) did not explain the exhaust/fuel differences, nor did they invalidate the conclusions on the effects of variables on PNA emission. Exhaust gas temperature and composition data are presented.

29202 **APTIC NO. 51207**

Hill, Robert F. and S. S. Penner

CARBONYL FORMATION FROM ISOOCTANE COMBUSTION IN AN INTERNAL COMBUSTION ENGINE. *Combustion Flame, 19(3):455-457, Dec. 1972. 7 refs.*

The formation of carbonyls from isooctane combustion in an internal combustion engine was examined. The carbon atoms in the fuel molecule were correlated with carbonyl compounds separated from the exhaust gas. The tendency for a carbon-carbon bond rupture was studied, and the probability of carbonyl compound formation was measured. The carbonyl compounds identified in the exhaust gas included formaldehyde, acetaldehyde, acetone, propionaldehyde, acrolein, and ketones.

29203 **APTIC NO. 51140**

Katz, M.

PROTECTION OF THE ENVIRONMENT THROUGH OIL-FIRED HEATERS. *(Umweltschutz durch Oelfeuerung). Text in German. Oel- Gasfeuerung, 17(3):176-184, 1972.*

Room heaters emit between 5.6 and 6.3% of the total pollutant emissions. Contrary to domestic heaters fired with solid fuels, the carbon monoxide emission from regularly cleaned and serviced heaters for liquid fuels are negligibly small. The increasing switch to oil-fired heaters has led to a reduction of the sulfur dioxide emission in cities such as Frankfurt, Munich, and London. The Federal Republic of Germany has 50.4 million individual home heaters, of these 6 million are fired with fuel oil. A new service computer for oil burners helps to locate faulty parts quickly which would doubtlessly have a negative influence on the combustion process. The combustion of heavy fuel oil still poses problems because of its changing quality. A test with heavy fuel oil from five different refineries with one and the same burner and same burner adjustment yielded soot numbers between 2 and 8 and particle concentrations between 50 and 500 mg/cu m. The so-called blue flame burner which burns with a soot-free flame has not yet been widely used because of the trend to smaller furnaces and to smaller combustion chambers. In the U. S. the maximum allowable sulfur concentration in fuel oil is regulated by laws. At present a sulfur concentration of 1% is permitted, beginning with 1975 this percentage will go down to 0.3%. A fuel oil desulfurization process is available in this country.

29204 **APTIC NO. 51302**

Mathur, M. L. and R. P. Sharma

A CASE FOR UNLEADED GASOLINE: REDUCED AIR POLLUTION AND BETTER ENGINE LIFE. *J. Inst. Engrs. (India) (Calcutta), 53(2):57-63, Nov. 1972. 28 refs. (Presented at the Institution of Engineers, Semi-Annual Meeting, New Delhi, India, Aug. 6, 1972.)*

The mechanism of knock control by the use of tetraethyl lead and the effects of leaded fuels on engine air pollution characteristics and design and operating variables are examined. Problems associated with the use of leaded gasoline include engine deposits, maldistribution of air-fuel ratio, reduced life of exhaust valves, valve seats, and spark plugs, increased air pollution, and reduced efficiency and life of anti-pollution devices. With respect to engine exhaust, the use of leaded gasoline significantly increases hydrocarbon emissions, increases the concentration of lead emitted into the atmosphere, and damages all types of catalysts used in catalytic converters. The implications of removing TEL from gasolines and trends in fuel additives are reviewed.

29205 **APTIC NO. 51531**

Middleton, R. L.

SOLAR POWERED ABSORPTION CYCLE HEAT PUMP USING PHASE CHANGE MATERIALS FOR ENERGY STORAGE. *NASA Tech. Brief, B72-10615:1-2, Oct. 1972.*

A solar-powered system was developed to provide heating and cooling as required in several applications, including residential homes. Energy accumulated in a solar collector is stored in phase change material for use in an absorption cycle heat pump during periods when direct solar energy is inadequate or not available. Heat from the phase change material drives off refrigerant gas from the absorbent liquid in a generator or desorber. The high-pressure refrigerant gas gives off heat as it is condensed. The condensed refrigerant is then expanded and boils in an evaporator with the absorption of heat. Gas leaving the evaporator is exposed to the absorbent liquid returning from the desorber after being cooled in a heat exchanger and is reduced in pressure. Cooling is also provided in the absorber to enhance the solution of the refrigerant gas in the absorbent liquid. The resulting liquid is then pumped to high pressure with a pump powered by a hydraulic motor and supplemented by an electric motor. The fluid is heated in a counter-flow heat exchanger, and additional heat is supplied to the desorber to separate the refrigerant gas from the absorbent liquid.

29206 **APTIC NO. 51322**

Montgomery, James A.

RECYCLE RATES REFLECT FCC ADVANCES. *Oil Gas J., 70(50):81-86, Dec. 11, 1972. 10 refs.*

Both operational and equipment changes in catalytic cracking have been brought about by the higher-activity zeolite catalysts and lower recycle rates. Reduced recycle requirements are possible because more fresh feed is converted to gasoline and other desirable products in the first pass and less recycle stock produced. The capacity for recycling, originally built into catalytic-cracking units, has been increasingly supplanted by fresh feed as a result of increased catalyst activity, unit modifications, and new unit designs (transfer-line crackers). Recycling will continue to be used to increase light fuel-oil yields, with heavy aromatic feedstocks, and with coker-gas oil. All the latest techniques are being applied to cut down of release of particulate matter and certain gases from cracking units. Three-stage cyclones, carbon monoxide boilers, and precipitators are used to remove catalyst fines and burn CO to carbon dioxide. A new fluid riser-line cracking unit converts over 98% of the CO to CO2 in the regenerator. With this unit there is no need for a CO boiler. A suitable balance of catalytic gasoline and alkylate must be reached by the individual refiner to optimize the octane number and the quantity of lead-free gasoline he can produce with modified or new cracking units. For refiners without alkylation facilities, the increased yield of gasoline and increased octane number of the gasoline will assist in offsetting lead removal.

29207 **APTIC NO. 51266**

O Quigley, Sean

JET ENGINE EMISSIONS. *J. Ir. Med. Assoc., 65(10):258-262, May 27, 1972. 10 refs. (Presented at the Medico-Legal Society, Oct. 1971.)*

The contribution to air pollution by commercial jet engine emissions is discussed. Only 3% of the total air pollution is attributable to aviation. Roughly 2/3, of this is the product of military and private flying. Aircraft are responsible for between 1 and 2% of all organic gases, carbon monoxide, and oxides of nitrogen emitted in Los Angeles county and 10% of all particulates. Reduction of particulate emissions from jet aircraft is both desirable and feasible. Engine manufacturers and airlines have indicated that improvements in turbine engine combustor design can be built into new engines and retrofitted on engines already in use. The introduction of the gas turbine engine was a major step in lowering the total tonnage of undesirable emissions from aircraft. Reduction in smoke is accompanied by a large reduction in particulates, with no comparable major change in the other constituents by the use of an engine equipped with the standard and reduced smoke burners.

29208 **APTIC NO. 51119**

Oxford, H.

ENVIRONMENTAL PROTECTION AND COMBUSTION TECHNOLOGY. *(Umweltschutz und Feuerungstechnik). Text in German. Oel- Gasfeuerung, 17(3):190-198, 1972.*

Firing systems emit combustion products which consist mainly of water vapor and carbon dioxide. Apart from this, varying amounts of the oxides of sulfur and metals are emitted. Light fuel oil produces no ash. Heavy fuel oil some ash; 10 to 30 ppm are usually measured in the waste gases. These values are based on combustion with a conventional air surplus and a carbon dioxide concentration of 11%. The sulfur oxides can be bound by addition of neutralizing additives such as magnesium or calcium oxide. This creates dust problems. The forming sulfates must be continuously drawn off. The oxides of nitrogen develop at any kind of combustion. Their fraction in the waste gas increases with the flame temperature and the air surplus. Soot and coke emissions are due to insufficient mixing. Overpressure burners are frequently used with furnaces which require a high starting pressure. Long preliminary ventilation times and overpressure reserve are of advantage for reduction of the soot development during the starting period. In addition, a high turbulence in the flame is required to achieve a long residence time for a most complete combustion of the hydrocarbons. The air must flow uniformly to all burners and must be uniformly distributed over all burner tube cross sections. The elimination of respirable dust proved to be an insoluble task with fuel oil combustion.

29209 **APTIC NO. 51454**

Ralph, E. L.

LARGE SCALE SOLAR ELECTRIC POWER GENERATION. *Solar Energy, 14(1):11-20, Dec. 1972. 9 refs.*

A new energy source for generating electric power is needed to meet demands in respect to resource depletion, increased electrical power requirements, peak demands, site location, low costs, and the elimination of pollution. Solar energy provides a solution to these problems. Solar energy could be tapped with present day technology. Features of a large scale solar cell electric power generating system that could be built to show the feasibility of utilizing solar energy are described. The basic system components are reviewed and an engineering analysis made of the electrical, optical, mechanical, and thermal characteristics of the system. Solar power station planning, design, and characteristics are discussed. (Author abstract modified)

29210 **APTIC NO. 51646**

Rex, Robert W. and David J. Howell

ASSESSMENT OF U. S. GEOTHERMAL RESOURCES. *Preprint, California Univ., Riverside, Inst. of Geophysics and Planetary Physics, 14p., June 15, 1972.*

It is evident from present operating geothermal plants in California that certain types of geothermal energy are technically feasible, practical, and economical. Present plants utilize natural steam that exists underground. Hot water geothermal fields are now being tested in the Imperial Valley of California and will be on production in a similar geological setting in northwestern Mexico in 1973. Geothermal energy can be considered a proven energy source in the U. S. at competitive prices. The western third of the U. S. plus Alaska and Hawaii seem to be the most richly endowed areas where low cost geothermal energy may be expected. The price-size relationship for the U. S. geothermal potential is reported. Several computer models were utilized to perform sensitivity analyses of variability of each cost element on profitability in developing geothermal resources. The key to development of the hot dry rock systems is the technology of rock fracturing. A major program of non-nuclear fracturing research is needed to test present hydrofracturing technology and to develop additional more effective methods.

29211 **APTIC NO. 51054**

Tomlinson, L. O.

COMPARING COMBINED CYCLE PLANTS. *Gas Turbine Int., 13(6):20-28, Nov.-Dec. 1972.*

The three basic combined cycles for electric utility application (unfired heat recovery cycle, supplemental fired heat recovery cycle, and the exhaust fired cycle) are described and compared. These systems all employ gas turbines and condensing steam turbine generators, and the basic differences are in the boilers and the proportion of the plant output this is produced by the steam system. The steam system produces about 30-35% of the plant capability in the unfired heat recovery cycle, about 35 to 60% of the plant output in the supplemental fired cycle, and about 60 to 80% in the exhaust fired cycle. The exhaust gases in the supplemental fired heat recovery cycle are used to the greatest extent possible for feedwater heating to achieve maximum efficiency. Since all the stack gas cooling duty in exhaust fired combined cycle must be performed by feedwater heating, cycles designed for maximum efficiency have complex feedwater heater arrangements. Two basic types of feedwater heating systems for exhaust fired cycles have evolved; one is the parallel feedwater heating system in which a secondary economizer is installed in parallel with the feedwater heaters, and the other is the less expensive short heater cycle feedwater heating system.

1971

29212 **APTIC NO. 51440**

Mikus, Thomas and John B. Heywood

THE AUTOMOTIVE GAS TURBINE AND NITRIC OXIDE EMISSIONS. *Combust. Sci. Technol., 4(4):149-158, Dec. 1971. 12 refs.*

A model was constructed to define the formation of nitric oxide in gas turbine engines and predict emissions for a range of engine designs. Absolute levels were predicted within a factor of two. The major parameters included the chemical kinetics of NO formation, the fluid flow pattern, and the thermodynamics of the hydrocarbon combustion process. An analytical model of a near-future turbine cycle was also designed, including values for temperature, pressure, combustion efficiency, and various operating variables. For NO control, the implementation of a leaner and more homogeneous air-fuel ratio distribution in the primary zone was most efficient.

1966

29213 **APTIC NO. 51461**

Cooper, Anna Grossman (ed.)

CARBON MONOXIDE. A BIBLIOGRAPHY WITH ABSTRACTS. *Public Health Service, Washington, D. C., Div. of Air Pollution, PHS-pub-1503, Rept. APTD-1349, Bibliography 68, 448p., 1966. 989 refs.*

NTIS: PB 213320

A bibliography with abstracts on carbon monoxide was compiled. The topics include analytical and measurement methods for CO determination, biological effects on humans and animals, blood chemistry in relation to CO poisoning, control, criteria and standards, instrumentation, sampling operations, and sources of CO emissions.

CONTROL METHODS

1973

29214 **APTIC NO. 51030**

National Academy of Sciences, Washington, D. C., Committee on Motor Vehicle Emissions

MOTOR VEHICLE EMISSIONS. *Environmental Protection Agency Contract 68-01-0402, 7p., Feb. 12, 1973.*

The technological feasibility of meeting motor vehicle emission standards set by the Clean Air Amendments was investigated. The possibility of developing and designing an emission control system that would enable compliance and mass producing of those systems of promising design were determined. The performance of such systems in customer usage, including the requirements for maintenance necessary to assure continuing reliability was reviewed. The costs, per vehicle, associated with acquisition, maintenance, and operation of the emission control system were evaluated. The five control systems reviewed included: modified conventional engine equipped with dual catalysts, or with dual catalysts plus thermal reactor, or with two thermal reactors and a reduction catalyst, or with a three-way catalyst and an electronic fuel injection; and the stratified-charge engine using fuel injection and equipped with an oxidation catalyst.

29215 **APTIC NO. 51363**

INDUSTRIAL SO2 SCRUBBER. *Steam Heating Eng. (London), 42(495):30-33, Feb. 1973.*

A Bahco sulfur dioxide scrubber is described to collect sulfur oxides from the flue gases after combustion. It provides up to 98% removal of SO2 from the flue gases of heavy oil-fired boilers. It also traps about 90% of the dust and 30% of the nitrogen oxides present in the flue gases. The scrubber is intended to solve the problem of sulfur emission from plants burning heavy fuel oils. The process yields either sludge or tailings in the form of soluble sulfur compounds according to the type of scrubbing liquid used. Limestone is usually used as the absorption medium. The scrubber is available in standard sizes for plant providing 11.5, 17.25, 34.5, 57.5, 69, and 115 MW to satisfy all requirements from large central heating plants to small power stations.

29216 **APTIC NO. 51366**

REMOVAL OF SULFUR DIOXIDE FROM WASTE GASES. *(Beseitigung von Schwefeldioxid aus Abgasen). Text in German. Sanit. Heizungstech., 38(3):249-250, March 1973.*

Bahco type waste gas desulfurization equipment, installed in central heat energy supply station of an inner city hospital in Stockholm, is described. The heat supply station comprises with three 25 MW boilers fired with fuel oil with 2.5% sulfur. The waste gas is admitted into a scrubber in which it passes a liquid bath in the lower zone at high speed, thus entraining wash liquid into another washing zone where the wash liquid, containing slaked lime or powdered limestone, is atomized by powerful turbulent motion. The use of other chemicals, such as sodium hydroxide, ammonia, or soda, is also possible. Sulfur dioxide is quantitatively bound in calcium sulfate, and wash liquid droplets are separated in a subsequent droplet separator. The efficiency of the desulfurization equipment is 98%, corresponding to a reduction of the hourly SO2 discharge from 120 to 3 kg. The residual dust content is 20-50/N cu m. Based on a yearly operation time of 5000 hr, the specific cost of desulfurization amounts to $4/cu m of fuel oil fired.

29217 **APTIC NO. 51686**

BROWNWOOD PLANT OFFERS CRUSHED STONE AND MANUFACTURED SAND. *Rock Prod., 76(2):65-68, Feb. 1973.*

A Texas quarry solved its dust problem by sprinkling haul roads with a mixture of water and oil-based emulsion and by confining the majority of crushing operations to one building. In addition, conveyors and dry screens are partially enclosed and equipped with a pressurized water vapor system. Minus 1-1/2 in. throughs from the primary crusher go to 5 by 10 foot wet screen; throughs from this screen go into a sand classifier and dewatering screw, then to a stockpile as manufactured sand. Plus 3/4 in. stone from the primary screen is carried on a conveyor belt to the main surge pile, reclaimed through a tunnel at the surge pile base, and returned to the crusher building for secondary crushing. Stocking conveyors carry finished products, including agricultural limestone, concrete aggregate, and cover stone, from the secondary crushing and screening operations to stockpiles built over a concrete tunnel. Prior to shipment, aggregates for the Texas Highway Department and other special orders are washed with salvaged rainfall in a single screw washer. An asphalt plant, also located on the property, uses a wet-collection dust system.

29218 **APTIC NO. 51380**

Ando, Akira

CONTROL OF EXHAUST EMISSION BY INLET MANIFOLD WATER INJECTION. *(Mizufunsha ni yoru haikigasu tokusei). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(4):372-381, April 1973. 18 refs.*

The effects of water injection on various aspects of engine performance, including exhaust emissions, were investigated using four-cycle, two-cycle, and diesel engines. Most of the current nitrogen oxide reduction methods cause lower developed engine power, increased fuel consumption, more carbon monoxide and hydrocarbon emissions, deterioration of engine performance, contamination of the engine, and abrasion. The water injection system with a 0.6-0.8 injection ratio solves these problems. The fuel consumption increased by only 4-8%, much less than other systems. The CO and HC increases are prevented by controlling the injection ratio to 0-0.8% or by using secondary air. The operational performance is unchanged, provided the injection ratio is kept at 0.6-0.8. The engine interior becomes even cleaner. No rusting of major parts was observed. Engine abrasion was reduced by removing water from the lubricant with an oil/water separator. To suppress NOx formation sufficiently, a water quantity equal to the fuel quantity must be injected.

29219 **APTIC NO. 51047**

Beers, W. D.

CHARACTERIZATION OF CLAUS PLANT EMISSIONS. *Processes Research, Inc., Cincinnati, Ohio, Environmental Protection Agency, Office of Research and Monitoring Contract 68-02-0242, Task 2, Program Element 1A2013, EPA-R2-73-188, 172p., April 1973. 88 refs.*

NTIS: PB 220376

Claus sulfur plant emissions and control are discussed based on literature, supplemented with data from companies operating or designing Claus plants. Process variations, investment, and operating costs are mentioned and data is listed for 169 Claus plants in 31 states, with daily sulfur capacities totaling over 15,800 long tons, most based on natural gas or petroleum refining. Total capacity of 66 Canadian plants is 60% more than the U. S. total. Tail gases from Claus plants are usually burned, converting the hydrogen sulfide to sulfur oxides. Annual emissions from U. S. plants are estimated to be 875,000 short tons of SO2 equivalent. Additional catalytic stages could eliminate about 70% of these emissions. The Beavon or Cleanair process could eliminate about 99% of the emissions, doubling investment and operating costs. The Institut Francais du Petrole (IFP) process could eliminate about 90% of the emissions; investment and operating costs for the IFP addition are about half of those for the Claus plant alone. Information on the Chiyoda and the Wellman-Power flue gas desulfurization processes is also presented. (Author abstract modified)

29220 **APTIC NO. 51048**

Beers, W. D.

NEUTRALIZATION OF ABATEMENT DERIVED SULFURIC ACID. *Processes Research, Inc., Cincinnati, Ohio, Environmental Protection Agency, Office of Research and Monitoring Contract 68-02-0242, Program Element 1A2013, EPA-R2-73-187, 54p., April 1973. 52 refs.*

NTIS: PB 220362

A flow sheet and economics are discussed for neutralizing abatement derived sulfuric acid with milled limestone in an aqueous slurry. The resulting gypsum is deposited in a settling pond and the supernatant is recycled to slurry fresh limestone. The process is based on a literature review. Results of pertinent laboratory experiments by American Smelting and Refining Co. are also discussed. Investment requirements for neutralization facilities are approximately $775,000, $1,530,000, and $2,875,000, respectively, for daily neutralizing capacities of 100, 350, and 1000 tons of H2SO4. When all of the H2SO4 is being neutralized, the incremental abatement costs for neutralization are approximately $53, $36, and $28 per ton of sulfur, respectively. When all of the H2SO4 is being sold, so none is neutralized, costs for the standby neutralizing facilities having daily H2SO4 capacities of 100, 350, and 1000 tons add about $5, $3, and $2 per ton of H2SO4, respectively, to the acid production costs.

29221 **APTIC NO. 51346**

Bobrova, L. A., A. G. Svinukhov, V. F. Sabitova, and S. Z. Nurulina

REMOVAL OF SULFUR COMPOUNDS FROM TECHNOLOGICAL GASES. *(Ochistka tekhnologicheskogo gaza ot sernistykh soyedineniy). Text in Russian. Khim. Prom. (Moscow), no. 2:43-44, 1973. 6 refs.*

Process and equipment for the removal of sulfur compounds from natural gas to be used for ammonia production are described. The natural gas, mixed with petroleum refinery waste gases, contains 0.05 to 0.15% sulfur dioxide by volume. The organic sulfur compounds present in the natural gas are converted into hydrogen sulfide in a converter filled with 481 copper catalyst containing 80-86.5% ferric oxide, 6-8.5% chromic oxide, and 7.8-10.2% copper oxide at a maximum temperature of 400 C and a maximum pressure of 4 atm. The resulting H2S is adsorbed in three parallel adsorbers filled with 481-Zn type adsorbent composed of at least 65% zinc oxide. The gas is then led though a tower with alternating layers of 481-Cu and 481-zinc for final purification. The converter and adsorber temperatures applied are 270 C and 210 C, respectively. The percentage of sulfur compounds converted and adsorbed by the catalyst and adsorbent is proportional to their concentration in the natural gas treated. A considerable portion of the H2S present in the raw gas is adsorbed in the converter by the catalyst. The total sulfur compound concentration is reduced from an initial value of 8.7 mg/cu m to 0.94 mg/cu m.

29222 **APTIC NO. 51410**

Burchard, Don

INDUSTRIAL ENERGY CONSERVATION. *Preprint, 8p., March 1973. 1 ref. (Presented at the National Plant Engineering and Maintenance Conference, 24th, Chicago, Ill., March 12-15, 1973, Paper 3.)*

Industrial energy conservation is discussed. The development of the energy crisis and the rising costs of obtaining electric power are reviewed. Suggestions are made on ways to reduce power consumption and cut down on costs, including: conducting a plant load survey, reducing maximum demand, checking the power factor -- the ratio of true watts to voltamperes or the phase relationship between voltage and current, rescheduling work for off-peak hours, converting to higher voltages, reducing ventilating air, cutting cooling in unoccupied spaces, using photocell switches, adding timeclock controls, cutting back the lighting load, raising thermostat settings to cut down cooling, continual equipment maintenance, alternative power sources -- unused or waste heat, and devising a total plant energy balance system.

29223 **APTIC NO. 51045**

Burton, J., G. Erskine, E. Jamgochian, J. Morris, R. Reale, and W. Wheaton

BASELINE MEASUREMENT TEST RESULTS FOR THE CAT-OX DEMONSTRATION PROGRAM. *Mitre Corp., McLean, Va., Environmental Protection Agency Interagency Agreement F192628-71-C-0002 and Contract 68-02-0650, EPA-R2-73-189, 226p., April 1973. 2 refs.*

NTIS: PB 220363

Results of the Baseline Measurement Test conducted for the Cat-Ox Demonstration Program are presented. The test was carried out on a steam generator unit. The measurement program is described for the test and procedures used to process data output from the continuous measurement system, steam generator operating data, and data obtained from the manual measurements. Information on the data reduction system is given, and the contents of the data base used for baseline test calculations. Results are presented for net and gross efficiency -- varying load level, excess air, and fue type; gas mass flow and gas volume flow -- varying load level and fuel type; and grain loading -- varying load level, fuel type, and the soot blowing cycle. Results for an overall sulfur balance are presented, and for comparing continuous measurement results with manual measurements and with theoretical values. (Author abstract modified)

29224 **APTIC NO. 51313**

Camner, Per, Per-Ake Helstrom, and Klas Philipson

CARBON DUST AND MUCOCILIARY TRANSPORT. *Arch. Environ. Health, 26(6):294-296, June 1973. 13 refs.*

Tracheobronchial clearance was studied by means of human inhalation of a test aerosol of 6 micron Teflon particles (density 2 gm/ml) tagged with technetium 99 m and subsequent external measurement of the radioactivity in the lungs for 2 hr. Clearance was studied twice in eight subjects: when they were inhaling carbon dust, and when they were not. Clearance was on the average significantly faster in the former case. Since the subjects inhaled carbon dust after inhaling the test aerosol, the faster clearance indicates a faster mucociliary transport. Percent retention of the aerosol is compared to the subject s smoking habits. (Author abstract modified)

29225 **APTIC NO. 51710**

Cheremisinoff, Paul N.

POLLUTION CONTROL INTERRELATIONSHIPS. *Preprint, 8p., March 1973. (Presented at the National Plant Engineering and Maintenance Conference, 24th, Chicago, Ill., March 12-15, 1973, Paper 39b.)*

The interrelationships of different types of pollution control are discussed. The control of air pollution, water pollution, solid wastes, and noise must be considered as a total system, for equipment designed to control one type of pollution may produce another type. Simultaneous air-water quality requirements are suggested. Pollution control methods in various industries are reviewed, including: the steel industry, foundries, calcium carbide plants, petroleum refineries, surface coating operations, plating, paper mills, electric power plants, and incineration of solid wastes. Various control methods are discussed, and their applicability to various industries and advantages and disadvantages are compared. Control equipment reviewed includes spray towers, spray chambers, venturi scrubbers, disintegrators, mist eliminators, fabric filters, and liquid cyclones.

29226 **APTIC NO. 51231**

Cosby, W. T.

PAPER 10. AN ENGINEERING APPROACH TO THE REDUCTION OF ATMOSPHERIC POLLUTION FROM COMBUSTION PROCESSES. *J. Inst. Fuel, 46(385):165-169, April 1973. 10 refs. (Presented at the Institute of Fuel, National Convention, 1st, Sheffield, England, June 5-8, 1972.)*

The engineer s problems in relation to the national progress towards clean air are discussed, with particular reference to the reduction of atmospheric pollution from processes involving combustion. Some examples are given in which a change to cleaner fuels has removed the problem. Other instances are cited in which the presence of solid and/or liquid particulate matter in the flue gases has currently to be accepted as endemic to the process. The widely varying nature of typical emissions is examined, especially those of carbon, dust, and fumes, together with the factors which determine the selection of gas cleaning equipment for their control and removal. Twenty-one economic and technical factors in gas cleaning plant selection are listed. The problem of the discharge of sulfur dioxide from combustion processes is put in some perspective. Brief reference is made to the relevant legislation governing emission standards and an assessment is made of the national reduction in atmospheric pollution achieved by the application of these standards over the past 15 years. Attention is drawn to the reduction in atmospheric pollution which could be quickly realized by a more positive approach to the correct operation of existing gas cleaning plants. (Author abstract)

29227 **APTIC NO. 51101**

Davids, P. and W. Brocke

TECHNICAL POSSIBILITIES FOR A REDUCTION IN THE EMISSION OF NOXIOUS SUBSTANCES FROM REFUSE INCINERATION PLANTS. *(Technische Moeglichkeiten zur Verminderung der Schadstoffemission aus Muellverbrennungsanlagen). Preprint, 1973, 21p., 10 refs. (Presented at the Refuse Meeting, 24th, Stuttgart, West Germany, March 8, 1973.) Translated from German, 16p.*

Control methods to reduce emissions of hydrogen chloride, hydrogen fluoride, sulfur dioxide, and nitrogen oxides from refuse incineration plants are reviewed. The design, operation, and specific application of wet scrubbing, alkaline absorbers, venturis, electrostatic precipitation, sorption, and dry stack gas purification are examined.

29228 **APTIC NO. 51718**

Davis, J. B.

POLLUTION PROBLEMS IN THE UK. *Prod. Finishing, 26(2):22-25, Feb, 1973. 10 refs. (Presented at the Pollution Control Conference, London, England, Nov. 1-3, 1972.)*

Control of air pollution in the United Kingdom is discussed. Industry has taken some positive steps and now domestic fires cause 80% of the smoke. But with this change, smoke emission has deopped from 2.3 million tons to 0.9 million tons/yr. Various methods of controlling air pollution are described. The problems of photochemical oxidation of certain pollutants and the odor from certain stoving plants are discussed. Solvent and stoving finish fumes can be incinerated, and the organic material can be destroyed by high temperature oxidation. Catalytic oxidation is used to lower the cost by reducing the operating temperatures. The surface coating industry is actively developing water-based coatings, high solids, low solvent-based coatings, and powder coatings which will assist pollution problem in this direction. Electrodeposition and electrostatic spray techniques for the application are recommended. United Kingdom with flat landscape, strong westerly winds, and poor ultraviolet concentration from low sunshine reduces pollution problems.

29229 **APTIC NO. 51691**

Dennis, W. L.

EFFECT OF HUMIDITY ON THE EFFICIENCY OF PARTICULATE AIR FILTERS. *Filtration Separation (Purley), 10(2):149-150, March/April 1973. 8 refs.*

Experiments are described which show that a very large variation in the nominal efficiency of dry air filters can be obtained if tests are carried out at different laboratory humidities. For a standard test, the humidity range specified must be considerably reduced from that of the official standard, or the test conditions closely related to those of use. (Author abstract)

29230 **APTIC NO. 51679**

Dyment, J.

SODIUM CHLORIDE AIR FILTER TEST: A METHOD OF IMPROVING THE STABILITY OF THE CALIBRATION CIRCUIT. *Filtration Separation (Purley), 10(2):163-164, March/April 1973.*

The sodium chloride aerosol air filter test is reviewed. The sodium flame test is widely used for checking high efficiency of air filters. To ensure accuracy and reproducibility, frequent calibration checks were made on the equipment. The convenience and stability of calibration by air dilution can be improved by a simple modification of the original process. The modification is described.

29231 **APTIC NO. 51540**

Effenberger, Herman K., Dan D. Gradle, and James P. Tomany

CONTROL OF HOGGED-FUEL BOILER EMISSIONS. A CASE HISTORY. *TAPPI, 56(2):111-115, Feb. 1973. (Presented at the Technical Association of the Pulp and Paper Industry, Environmental Conference, Houston, Tex., May 14-18, 1972.)*

The design and operation of a hogged-fuel (wood waste) boiler installation are examined with respect to burner processes, waste disposal problems, air pollution regulations, and emission control systems. The emissions from hogged-fuel boilers consist only of fly ash particulates containing a high proportion of carboniferous material or char. Approximately 85% of the particles are less than 10 micron in size. Initially the fly ash emissions were controlled by multiple cyclone collectors, but removal efficiency was inadequate to achieve the government emission standards. To further decrease fly ash emissions, scrubbers were installed to clean the multiclone exit gases. Collection efficiencies of 98.3% were achieved at a pressure drop of 8.5 in. w.g. An overall maximum collection efficiency of 99%+ was estimated. With this system, final discharge emissions of 0.035-0.015 grains/dry standard cu ft were obtained.

29232 **APTIC NO. 51499**

Eguchi, Yoshitomo

ACTIVATED CARBON. *(Kasseitan). Text in Japanese. Sekiyu Gakkai-shi (J. Japan Petroleum Inst., Tokyo), 16(5):387-391, May 1973. 9 refs.*

Activated carbon is used in air pollution, water pollution, and soil pollution control. In Japan, 20 companies produce 30,000 tons of activated carbon/yr, about 20,000 tons are powdered and about 10,000 tons are granulated. The activated carbon has adsorptive, catalytic, reactive, and holding properties. It can be used to remove nitrogen dioxide from combustion gas, to prevent the discharge of organic solvents, to prevent the evaporation of gasoline from automobiles, to prevent radioactivity from atomic energy facilities from discharging, to prevent harmful gases and bad odors from discharging from factories, to clean air in buildings, and to treat water.

29233 **APTIC NO. 51504**

Enoto, Haru and Hiroshi Hayashi

A STUDY OF THE EXHAUST GAS CLEANING CATALYST CONVERTER PERFORMANCE TEST METHOD (NO. 7) -- EVALUATION OF THE HYDROCARBON OXIDIZING POWER OF A MONOLITHIC CATALYST BY TEST PIECE. *(Haiki Joka shokubai konbata seino shikenho no kenkyu (dai 7ho) -- tesuto piisu ni yoru monorishikku shokubai no tankasuiso sanka seino hyoka). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, Inc., Tokyo, p. 75-80, 1973. 7 refs. (Presented at the Society of Automotive Engineers of Japan, Study Meeting, 27th, Tokyo, May 23-24, 1973, Paper 8.)*

Hydrocarbons are generally less oxidized than carbon monoxide and require a high temperature in the catalyst bed. Monolithic catalysts were compared with granular catalysts composed of alumina supporting platinum and palladium catalysts. Ethane, methane, propane, n-hexane, ethylene, propylene, acetylene, benzene, and toluene were used as test hydrocarbons. The Pd catalyst cleaned paraffins better than Pt. The monolithic catalyst cleaned better than the granular for ethane and methane and for both Pt and Pd catalysts. The monolithic catalyst cleaned propane better than the granular catalyst for Pt catalyst. For carbon-rich hydrocarbons such as hexane, the Pt catalyst cleaned better than the Pd catalyst. The granular catalyst cleaned CO better than the monolithic catalyst.

29234 **APTIC NO. 51312**

Farkas, Jozef

RECENT KNOWLEDGE RELATED TO THE THEORY AND PRACTICE OF THE SULFUR CONTAINING EMISSION CONTROL. *(Nove poznatky v teorii a praxi likvidacie sulfatovych exhalatov vo svete). Text in Slovak. Papir Celuloza, 28(2):24-27, 1973. 77 refs.*

Emissions from sulfate cellulose, manufacture (kraft pulping) include hydrogen sulfide, methyl mercaptan, dimethyl sulfide, dimethyl disulfide, isopropyl mercaptan, ethyl bisulfide, and propyl disulfide. The sources of these pollutants are boilers, heat diffusion and regeneration, contact evaporators, and regeneration furnaces. The pollutants are emitted in the form of uncondensed gases and of condensates. The principal gas absorption method involves the use of one or another type of washer. The captation and combustion of uncondensed gases is gaining in use, especially combustion in special burners. The advantage of this method is that it is independent on the operation of the plant, the disadvantage is in the risk of expolsion. Oxidation of waste gases combined with combustion is used in catalytic waste gas combustion where the gases pass over copper oxide at 700 C and the resulting sulfur dioxide is further processed. Black liquor is oxidized with the purpose of stabilizing the sulfur compounds it contains by converting sulfides to thiosulfates and by other reactions. Oxidation of condensates is based on the same principle as that of gases or of black liquor. Liquid wastes from bleaching plants containing chlorine and chlorine compounds are reportedly used for this purpose. Purification of condensates has the additional advantage of increased purity of liquid wastes emitted by cellulose plants. It is generally accepted that continuous boiling of cellulose has the advantage of being a technologically and economically more advantageous method of production, but the method is also better suited for the control of emissions.

29235 **APTIC NO. 51352**

Ficek, Kenneth J.

POTASSIUM PERMANGANATE FOR CLEANER AIR AND WATER. *Paint Varnish Prod., 63(5):45-49. May 1973. 6 refs.*

The application of potassium permanganate to the control of air and water pollution in the paint and surface coating production industries is examined. The reactions of $KMnO_4$ with various pollutants with respect to oxidation in process solutions, waste water, and contaminated air streams were reviewed. Mercaptans and other noxious sulfur compounds are converted into odorless sulfates by treatment with $KMnO_4$ solution in a wet scrubber, is also effective and economical for odor control.

29236 **APTIC NO. 51252**

Giavarini, Carlo, Giancarlo Maura, and Gilberto Rinaldi

ACID GAS ABSORPTION BY MODIFIED ALIPHATIC POLYAMINE SOLUTIONS. *(Assorbimento di gas acidi con soluzioni di poliammine alifatiche modificate). Text in Italian. Chim. Ind. (Milan), 55(1):23-29. Jan. 1973. 11 refs.*

Aqueous solutions of aliphatic polyamines possess a greater absorptive capacity for acid gases than alcanolamines used industrially, but they regenerate only with difficulty because of their high alkalinity. Substitution of alkylolic groups for hydrogen atoms in amino groups reduces the alkalinity of these groups and thus facilitates regeneration of solutions saturated with acid gases. Substitution can be accomplished by a reaction of polyamines with propylene oxide, ethylene carbonate, or formaldehyde. Products of such modification were used for the absorption and desorption of carbon dioxide and hydrogen sulfide from gaseous mixtures. Best results were obtained by modification of tetraethylenepentamine with formaldehyde at a molar ratio of 1:0.5. At this ratio the reaction of TEPA with CH_2O does not lead to polymerization which would increase viscosity. During desorption modified TEPA behaves like TEPA but regenerates easier. Both absorption and desorption of CO_2 and H_2S with modified TEPA was equally satisfactory.

29237 **APTIC NO. 51104**

Goldschmidt, K.

EXHAUST GAS DESULFURIZATION. STATUS OF WORK AND RESULTS AT STEAG. *(Abgasentschwefelung. Stand der Arbeiten und Arbeitsergebnisse der STEAG). Preprint, Vereinigung der Grosskesselbesitzer, e.V., Essen (West Germany), 1973. 2 refs. (Presented at the Vereinigung der Grosskesselbesitzer, Conference on Power Plants and the Environment, Essen, West Germany, Feb. 28, 1973.) Translated from German, 16p.*

Control methods implemented at a power plant to reduce sulfur dioxide emissions in the stack gases are reviewed. The design, operation, and efficiency of the Bischoff procedure for dust removal and SO_2 control using lime scrubbing; the Bergbau Forschung method for dry SO_2 adsorption on coke, thermal regeneration, and recovery of elemental sulfur; and the Lurgi hydrogen sulfide scrubber method for the desulfurization of gasified coal are examined.

29238 **APTIC NO. 51555**

Goncharov, A. Ye. and M. V. Fedotov

INTENSIFIED PROCESS FOR THE REMOVAL OF SULFURIC ACID MIST FROM GASES BY ELECTROSTATIC TECHNIQUE. *(Intensifikatsiya protsessa elektroochistki gaza ot tumana sernoy kisloty). Text in Russian. Khim. Prom. (Moscow), no. 4:49-51, 1973. 7 refs.*

An intensified process for the separation by wet electrostatic precipitators of finely dispersed sulfuric acid mist and arsenic from sulfuric acid contact process and from nonferrous metallurgical processes is described. The electrode voltage was increased by the use of automated semiconductor devices, and regular hexahedral electrodes were replaced by needle type electrodes providing increases of 250% in the linear current density and of 10% (from 85% to 95%) in the separation efficiency. The increase in the separation efficiency was due to increased particle drift occurring in the electrostatic field, and partly to the effect of the electric wind. Comparative tests revealed considerably higher efficiency of needle electrodes for humid waste gases from evaporative scrubbers than for gases coming from conventional scrubbers, which was due to a decrease by three-four times the sulfuric acid mist concentration after the second stage of the evaporative scrubbers.

29239 **APTIC NO. 51156**

Guenther, Ernst

THE METALLURGICAL PLANT OITA OF THE NIPPON STEEL CORPORATION. *(Das Huettenwerk Oita der Nippon Steel Corporation). Text in German. Stahl Eisen (Duesseldorf), 93(11):488-493, May 24, 1973. 7 refs.*

The Oita metallurgical plant produces 12 million tons/yr of crude iron. The installation of specially efficient equipment for air and water cleaning was necessary. Oita has an ore crushing and screening plant with five breakers and 11 screens. Two sintering plants with a combined sintering capacity of 27,000 tons/day are equipped with electrostatic precipitators for waste gas cleaning. Two further precipitators are installed for dust cleaning inside the workshop. A twin stack of 200 m discharges the remaining waste gas at a speed of 30 m/sec. The coke furnaces are all equipped with dust exhaust hoods. The waste air from here is cleaned in scrubbers. A detailed description of the individual stations of the metallurgical plant is given.

29240 **APTIC NO. 51237**

Guerri, Elmer A.

INDUSTRIAL LAND APPLICATION SPRAYFIELD DISPOSAL AND WILDLIFE MANAGEMENT CAN COEXIST. *TAPPI, 56(4):95-97, April 1973. (Presented at the Technical Association of the Pulp and Paper Industry, Environmental Conference, Houston, Tex., May 14-18, 1972.)*

A land application sprayfield waste disposal system which has operated successfully since 1961 is described. The system disposes of 200,000 gal of 10% solids sodium base concentrated waste from a 250-ton/day hardwood pulp mill daily. The waste is sprayed at 185-195 deg F over a total area of 250 acres. The spray application rate is low, and naturally occurring rainfall is collected through a drainage system and resprayed onto the fields. Runoff, ponding, and anaerobic decomposition of wastes with the accompanying air pollution problems are minimized by this method. Contour plowing also reduces runoff and increases the service life of the field. Although the sodium applied to the field destroys much of the soil structure, agricultural rejuvination techniques can restore the soil in anywhere from 2 to 4 years. The mill personnel have found that employing land rejuvination procedures, monitoring soil parameters, stressing proper employee attitudes, observing strict spray schedules, and minimizing runoff and ponding will allow continued operation of the system. This land application sprayfield waste disposal system coexists in an area with a healthy, well-balanced game population and does not produce permanent harmful soil effects or odors. (Author abstract)

29241 **APTIC NO. 51387**

Hayashi, Takashi

TREATMENT OF CONTAMINATED EXHAUST AIR. *(Haigasu shoriho). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 11(1):36-41, April 1973. 3 refs.*

Methods of treating exhaust gases inside factories are described. Factories manufacturing metal oxides are a source of harmful dust. Such factories should have good ventilation and several electrostatic collectors of 500 cu m/min capacity. Dust collection at the furnace is also recommended. Fresh air should be taken in to replace clean air exhausted from the electrostatic dust collector on the roof. Moveable bag filters can also be used. Future factories will be built without windows and with complete air conditioning facilities to make pollution control easier.

29242 **APTIC NO. 51518**

Hayashi, Taro

A LOCAL EXHAUSTING METHOD IN LEAD PROCESSING WORK. *(Namari sagyo no kyokusho haikiho). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 11(1):16-22, April 1973. 3 refs.*

Lead fumes and dust can be emitted during lead refining and purification, lead battery manufacturing, electric wire and cable manufacturing, soldering, and heat treatment of molten lead. A push/pull hood method was developed to avoid lead pollution in processes such as painting. The hood reduced toluene in a painting room from 400-2000 ppm to 2 ppm.

29243 **APTIC NO. 51326**

Henderson, J. S. and J. E. Roberson

NINETEEN HUNDRED AND SEVENTY-ONE PRECIPITATOR SURVEY. *TAPPI, 56(4):91-94, April 1973. 3 refs. (Presented at Technical Association of the Pulp and Paper Industry Environmental Conf., Houston, Tex., May 14-18, 1972.)*

A survey done on precipitators in 1971 is reviewed. The survey was initiated to pinpoint problem areas for further investigation, to assess long-term precipitator performance and reliability, and to survey the pulp and paper industry's efforts in checking precipitator performance. The survey covered collector units placed in operation since Jan. 1, 1966, and with a collection efficiency of 98.0% or more. Questions covered design data, collector construction, collector performance, and operating experience. Maintenance costs, problem areas, and stack test results were included. Responses covered 20 conventional recovery boilers and four noncontact recovery boilers. This represented 30% of the total (75) collectors installed since 1966 (and with an efficiency of 98.0% or better). (Author abstract)

29244 **APTIC NO. 51437**

Horowitz, Joel

THE EFFECTIVENESS AND COST RETROFIT FOR REDUCING AUTOMOBILE EMISSIONS. *J. Air Pollution Control Assoc., 23(5):395-397, 418, May 1973. 10 refs.*

Several automobile retrofit devices that are potentially applicable to pre-1975 vehicles were evaluated by the Environmental Protection Agency. The results of this evaluation are described and used to estimate the effectiveness and cost of retrofit for reducing total automobile emissions in the period 1975-1985. Retrofit combined with inspection/maintenance can potentially achieve reductions in automobile emissions of 33%-60% in 1975, depending on the pollutant, and 10%-20% in 1985. The estimated present value discounted to 1972 of the average cost per retrofit vehicle is $30-$152 over the period 1975-1985 depending on the retrofit system used. The corresponding annualized cost is $6-$28 per vehicle. Retrofit systems reviewed included air bleed, exhaust gas recirculation, and catalytic converters for the reduction of hydrocarbon, carbon monoxide, and nitrogen oxides emissions. (Author abstract modified)

29245 **APTIC NO. 51396**

Hosho, Yukio

RECENT PROBLEMS OF A CARBURETOR FOR REDUCTION OF EXHAUST EMISSIONS. *(Haikigasu taisaku kara mita saikin no kikaki no mondaiten). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(4):402-410, April 1973. 12 refs.*

Because the air/fuel ratio directly affects the exhaust emissions of carbon monoxide, hydrocarbons, and nitrogen oxides, the carburetor plays an important role in reducing exhaust emissions. The performance characteristics of the carburetor for atomization of fuel, optimum air/fuel ratio in various engine modes, and even distribution of the mixture gas to each cylinder are important. When an exhaust gas cleaner is used, the air/fuel ratio must remain very flat, giving a flat mixture. The catalyst temperature rises by 200 C/1% CO content of the exhaust gas. Since the highest temperature may not exceed 700-800 C for the catalyst, the maximum allowable CO content is 3% for which the air/fuel ratio is 13.5. Exhaust gas recirculation and a catalytic converter are used to reduce NOx. The NOx reduction rate increases with higher rates of recirculation, but a thicker air/fuel ratio is needed for operational reasons when more exhaust is fed back. The HC emission increases during deceleration. Therefore, the throttle valve opening is adjusted and/or other measures such as an auxiliary fuel system and boost control deceleration device are employed to make up for what the air/fuel setting alone cannot achieve. An acceleration enricher, air/fuel ratio adjustment due to altitude and temperature, improvement of heat resistance, cold cycle countermeasures, and diesel engine controls are also discussed.

29246 **APTIC NO. 51414**

Jamison, A. E.

CASE STUDY IN DESIGN, INSTALLATION, AND PROVE-IN OF PLATER FUME SCRUBBING SYSTEMS. *Preprint, 7p., March 1973. (Presented at the National Plant Engineering and Maintenance Conference, 24th, Chicago, Ill., March 12-15, 1973, Paper 39a.)*

The Oklahoma City Works of the Western Electric Co., has plating operations that require air exhaust fume scrubbing of about 250,000 cu ft/min. During 1970, 1971, and 1972 a completely new scrubber system was designed, installed, and proved in. A case study is presented covering the equipment selection, design criteria, installation, and prove-in of the new scrubbing system. In replacing the system, versatility and efficiency, installation problems, operation and maintenance, and capital and operating costs were taken into consideration. Testing facilities for the extended surface scrubber, the vertical packed tower scrubber, and the fans are described. The results of stack sampling tests are given.

29247 **APTIC NO. 51656**

Kawada, Shin

COUNTERMEASURES AGAINST NITROGEN OXIDES IN LARGE SCALE BOILER EXHAUSTS. *(Ogata boira haigasu no chisso sankabutsu taisaku). Text in Japanese. Preprint, Fuji Techno-System Inc., Tokyo (Japan), 21p., 1973. (Presented at the Seminar on Comprehensive Countermeasure Against Nitrogen Oxides, Tokyo, Japan, Feb. 14-15, 1973.)*

Combustion conditions inside boilers affect the emissions of nitrogen oxides. Temperature, reaction time, oxygen concentration, and retention time of the combustion gas have the greatest influence. Most of the NOx is produced at the fire gate as nitric oxide; NO formation accelerates when abnormally high temperatures occur. Lowering combustion temperature, reducing oxygen partial pressure in the high temperature combustion area, and shortening combustion time at high temperatures can be used to reduce NOx. But to lower the flame temperature, the cooling area of the furnace must be increased, the recirculation gas must be used as a coolent, the air temperature must be lowered, the two-stage combustion system must be adopted, and the slow burning by the reduction of the air velocity at the burner throat must be attained. To reduce partial pressure of oxygen, two-stage combustion must be adopted.

29248 **APTIC NO. 51348**

Kazatsev, Ye. A.

ON CERTAIN MEASURES AIMING AT THE ABATEMENT OF AIR POLLUTION BY INDUSTRIAL EMISSIONS. *(O nekotorykh meropriyatiyakh, napravlennykh na predotvrashcheniye zagryazneniya atmosfernogo vozdukha promyshlennymi vybrosami). Text in Russian. Kauchuh i Rezina, no. 2:1-2, 1973.*

Effort and measures taken in the carbon black and synthetic rubber manufacturing industries in the USSR are surveyed. Reactors, furnaces, drying ovens, forced-air conveyor, and aspiration systems are the main sources of emission in the carbon black industry. Glass-fiber TSFRN(b) with increased thermomechanical efficiency and filtration efficiency has been developed for the separation of fine carbon black. Simple and multi-sectional glass-fiber bag filters, series cyclones, and thermal or catalytic afterburning systems are presently available for the removal of carbon black from waste gases. Three-pole, horizontal electrostatic precipitators are used for the separation of carbon black in furnace black, oil-based furnace black, and carbon gas black production. Polyamide fiber tissues with a thermal stability of 260-300 C, and a waste gas purification process capable of handling gases with a temperature of 400-500 C are being studied. Highly efficient, oxidizing catalyst with improved mechanical strength, thermal stability, and reduced hydraulic resistance has been developed for the catalytic incineration of organic sulfur compounds as emitted in the synthetic rubber industry.

29249 **APTIC NO. 51395**

Kishi, Yoshio

EXHAUST EMISSION CONTROL AND MOTOR OIL OF AUTOMOBILE ENGINE. *(Jidoshayo enjin no haishutsugasu taisaku to enjinyu). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(4):382-388, April 1973. 30 refs.*

The quality of motor oil used in automobile engines using no-lead gasoline is discussed. Effects of no-lead gasoline on cleanliness, rusting, and abrasion are mentioned. Aromatic and olefin content of the gasoline helps prevent rust and causes little difference in abrasion except for valve recession. Non-lead gasoline produces less oil thickening. The effects of exhaust gas recirculation, thermal reactors, and catalytic converters on the engine are discussed. The catalytic converter is easily poisoned by the ash content of the motor oil.

29250 **APTIC NO. 51722**

Klimisch, Richard L. and Kathleen C. Taylor

AMMONIA INTERMEDIACY AS A BASIS FOR CATALYST SELECTION FOR NITRIC OXIDE REDUCTION. *Environ. Sci. Technol., 7(2):127-131, Feb. 1973. 16 refs. (Presented at the California Catalysis Society Annual Meeting, April 29, 1972, and at the Philadelphia Catalysis Club, Spring Symposium, May 9, 1972.)*

The effect of catalyst composition on the products formed in the reduction of nitric oxide was studied to understand the catalytic chemistry of automotive emission control. The ratio of ammonia to nitrogen in the products of the NO reduction is primarily a function of the catalyst s ability to promote the decomposition of ammonia. The effects of catalyst composition on product formation can be rationalized on the basis of a mechanism involving the formation and subsequent decomposition of ammonia. Dual functionality and synergistic effects are noted for catalysts containing nickel in combination with copper, platinum, or palladium. In these catalyst the ammonia decomposition function resides primarily in the nickel, while the reduction activity is derived from the other metal. Ruthenium is an unusual material that is able to perform both functions efficiently. The effects of water and oxygen on the product distribution are discussed. (Author abstract modified)

29251 **APTIC NO. 51503**

Kobana, Shoji

COMBUSTION DEODORIZATION EQUIPMENT BY MAXON SYSTEM. *(Makison shisutemu ni yoru nensho dasshu sochi). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 2(10):59-63, March 1973.*

Afterburners are used for deodorization and removal of smoke and dust; however, they generally fail to dispose of invisible pollutants such as gaseous hydrocarbons because of lack of heat for effective combustion of these pollutants. A new burner is described which deodorizes bad odors more effectively. The combustion process accelerates oxidation. Organic substances and sulfur compounds can be eliminated because temperature is controlled very easily.

29252 **APTIC NO. 51413**

Kudo, Kazuyoshi, Hideo Hosoda, Senji Honma, Katsuji Ishibashi, Yoshio Noda, Shigeo Mitsui, Kyoji Nara, Kihachiro Sasaki, Katsunobu Tatsumoto, and Masayoshi Komatsu

STUDIES ON PRODUCING ACTIVE CARBON FROM COAL PILOT PLANT OPERATION IN A 630 MM FLUIDIZED BED. *(Sekitan o genryo to suru kasseitan no seizo -- ryudoro ni yoru chukan shiken). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 52(553):325-335, May 1973. 23 refs.*

The production of active carbon from coal using a pilot scale fluidized bed reactor system is described. The internal diameter of the reactor for carbonization and activation was 500 mm and 630 mm, respectively. The heat of combustion from the feed coal was used as the energy source for the carbonization process, and the heat of combustion of mine gas (about 60% methane) was used for the activation process. An exchangeable perforated plate used for the fluidizing of char was of an inverse conical type, with a pin hole diameter of 2 mm and pin hole opening ratio of 2%. The active carbon carbon obtained from the experiments had an internal surface area of 900-1000 sq m/g and a methylene blue adsorbability of 180-200 mg/g. Active carbon was favorable for practical use as an adsorbent.

29253 **APTIC NO. 51424**

Kuroda, Hiroshi, Yasuo Nakajima, Yoshimasa Hayashi, and Kunihiko Sugihara

A CONCEPT OF HC/CO OXIDIZING TRIGGER TEMPERATURE IN THE EXHAUST SYSTEM -- ECONOMICAL MATCHING OF THE THERMAL REACTOR TO THE ENGINE. *(Haikikei ni okeru HC.CO sanka toriga ondo ni kansuru kangaekata - samaru riakuta no keizaiteki macchingu shuho). Text in Japanese. Nissan Giho (Nissan Tech. Rev.), 8(48-1):21-19, 1973. 4 refs.*

The oxidation of hydrocarbons and carbon monoxide in the exhaust system of the engine is mainly affected by thermal characteristics of the exhaust system and the fuel consumption. A principal relation between the engine inlet air/fuel ratio and the gas temperature preceding the oxidizing reaction in thermal reactors was found in the developing and testing process of the thermal reactors. This temperature was defined as HC/CO oxidizing trigger temperature. Economical matching technique of the thermal reactor to the engine is arrived at by obtaining the HC/CO oxidizing trigger temperature by modifying engine settings.

29254 **APTIC NO. 51666**

Lo Cicero, Paul M. and Danry E. Sjolseth

OPERATING EXPERIENCE WITH A RECOVERY FURNACE ODOR CONTROL SYSTEM. *TAPPI, 56(1):76-79, Jan. 1973. 5 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Environmental Conference, Houston, Tex., May 14-18, 1972.)*

Operating experiences with the Combustion Engineering air contact evaporator low odor recovery boiler fired with 62-68% black liquor solids are described. This system minimizes total reduced sulfur emissions (under 10 ppm) by using heated combustion air instead of flue gas at the cascade evaporator. The combustion air is indirectly heated by two regenerative heaters located after the economizer, which eliminates direct contact of hot flue gases with the liquor stream. Particulate matter is removed from the flue gases by a 99.6% design efficiency electrostatic precipitator. Significant problems with the system included: air heater pluggage and corrosion, precipitator maintenance, salt cake handling, and sulfur dioxide-sulfur trioxide emissions. Solutions to these problems are presented. (Author abstract)

29255 **APTIC NO. 51453**

Loomis, Edmond C.

AGRICULTURAL SANITATION OF LIVESTOCK MANURES FOR CONTROL OF FLIES, ODORS, AND DUSTS. *J. Milk Food Technol., 36(1):57-63, Jan. 1973. 16 refs. (Presented at the International Association of Milk, Food, and Environmental Sanitarians, 58th Annual Meeting, San Diego, Calif., Aug. 15-19, 1971.)*

Agricultural sanitation of livestock manures to control flies, odors, and dusts is discussed. Industrial agriculture and urban-rural growth are mainly responsible for the flies, odors, and dusts associated with livestock industries. Manure from animal confinement type operations is a major source of these nuisances. Drylot dairies, beef feedlots, and raised wire-cage poultry ranches are the main industries which affect the co-existence of agricultural and suburban living. Physical, mechanical, biological, and chemical methods are combined into an integrated control program with major emphasis on manure management including, collection, disposal, and use. Domestic fly control by insecticides, and dust and odor control in poultry, dairy, and feedlot operations are also reviewed. (Author abstract modified)

29256 **APTIC NO. 51329**

Muermann, H.

DUST COLLECTORS FOR INDIVIDUAL OR GROUP DUST COLLECTION. *(Entstaubungsgeraete zur Einzel- oder Gruppenentstaubung). Text in German. Metall (Berlin), 27(6):570-574, June 1973.*

Dust collectors for drawing off dust from single or groups of production machines usually include a ventilator, a collector, and a dust bin. The ventilator is usually arranged on top of the collection system. A small dust collector is illustrated with a capacity for drawing off between 6 and 20 cu m air/min. For dust collection it contains an oil-wetted metal filter. The collection principle of this filter is based on deflection of the air flow so that the dust falls out through the forces of inertia. The dust collection efficiency of the filter reaches 92 to 96%. Another dust collector is illustrated for drawing off 14 cu m/min. It is equipped with a cotton, wool, or synthetic fiber filter. The dust retained by the filter is either brushed off or rapped off. Two more filters are illustrated with envelope-type cloth filters mounted on a frame. Each individual cloth filter can be replaced. The filter area is so large that a 100% collection efficiency can be achieved. Motorized rapping devices are used for cleaning these filters. Finally, a wet dust collector is shown where the ventilator, dust collector, and dust storage bin are likewise combined to one unit. The dust-laden air enters the collector tangetially and moves in spirals down to the water-filled sludge container.

29257 **APTIC NO. 51486**

Oeben, Rudolph W., Omar Muniz, and Raymond A. Payne

POLLUTION CONTROL AT CARBIDE PONCE. *Chem. Eng. Deskbook, 80(14):145-151, June 18, 1973. 2 refs.*

Pollution control measures, costing over $12 million, at a large petrochemical plant in Puerto Rico are reviewed. The plant produces 775 million lbs/yr of ethylene, 400 million lbs/yr of propylene plus derivative products including butadiene, ethylene oxide, ethylene glycol, glycol ethers, phenols, cumene, polyethylene, and bisphenol-A. Examples of in-plant control to minimize waste streams are extraction and distillation equipment for recovery of phenol wastes and a process water stripper in the furnace gas-quench system. Terminal treatment facilities for total wastewater flow provide for waste collection in skimmer basins, primary treatment in API-type clarifiers, neutralization with sulfuric acid or caustic, equalization and emergency storage in 2.5 million gas equalization basins, nutrient addition (phosphoric acid and anhydrous ammonia), and biological treatment with anaerobic and aerated stabilization systems. Objectional organic vapors are routed to flare stacks; sufficient quantities of steam, provided at the tip of the flares, maintain smokeless combustion. Scrubbers, dust collectors, activated carbon filters, and incinerators control emissions that are not routed to the flares. Sulfur dioxide discharged from steam boilers is not a problem because low-sulfur liquid residue is the major fuel. Hydrocarbon emissions are to be controlled by techniques such as internal floating roofs in storage tanks, catalytic oxidation, additional flares, and refrigeration of tank contents to reduce vapor pressure. Organic residues are disposed of in tangentially fired boilers or in incinerators with burners using steam for atomization. Combustible solid wastes are burned in an excess-air incinerator.

29258 **APTIC NO. 51153**

Oppermann, Herbert

CITY CLEANING AT HAMBURG. *(Die Stadtreinigung Hamburg). Text in German. Staedtehygiene (Uelzen/Hamburg), no. 4:78-84, 1973.*

The total refuse quantity at Hamburg rose from 0.76 million cu m in 1949 to 4.68 million cu m in 1972 annually and is expected to reach 8 million cu m in 1980. The greatest part of the refuse is removed in an incineration plant. The refuse is emptied into a bin of 7000 cu m and from there fed onto the reversed backstoking feed grates having a throughput of 2 times 19.5 t/hr, at a heating value of 2000 kcal/kg. Temperatures in the combustion room reach 1000 C rendering the flue gases completely odorless. However, the dust content is still 5 to 10 g dust/cu m. In special boilers with a steam capacity of 40 t/hr, the hot flue gases are cooled to 250 C and then led through electrostatic filters. After passing the filters, the dust content of the waste gas is below 150 mg/cu m and the carbon dioxide contents amounts to 7%. The steam from the boilers is used in a nearby power generating plant.

29259 **APTIC NO. 51554**

Osmanov, M. O., M. Yu. Sultanov, and M. S. Belenkiy

EFFICIENCY OF PLATINUM, PALLADIUM, AND COPPER-CHROMIUM OXIDE CATALYSTS IN EXHAUST GAS CLEANING. *(Effektivnost primeneniya platinovogo, palladiyevogo i mednokhromookisnogo katalizatorov dlya obezvrezhivaniya otrabotavshikh gazov dvigatelya). Text in Russian. Avtomob. Prom., no. 3:13-14, 1973.*

The efficiency of platinum, palladium, and copper-chromium oxide catalysts in cleaning exhaust gas was studied under different stoichiometric conditions at a volume rate of 90,000/hr and at an exhaust gas temperature of 350 C. Platinum and palladium catalysts were efficient under conditions of oxygen content exceeding by at least 10 times the stoichiometrically necessary value. All three types of catalysts were of equally high efficiency under conditions of oxygen excesses ranging from 200 to 500%. The copper-chromium oxide catalyst was decidedly superior to platinum and palladium catalysts at nearly stoichiometric ratios of carbon monoxide, hydrogen, and oxygen. The same catalysts were also ineffective in cases when the oxygen content was below the stoichiometrically necessary value, whereas the copper-chromium oxide catalyst oxidized hot components until the oxygen content was totally used up. While both platinum and palladium catalysts were rendered ineffective after 10 hr operation on ethylated gasoline, lead had no effect on the efficiency of the copper-chromium oxide catalyst during 50 hrs operation.

29260 **APTIC NO. 51299**

Padfield, Don H.

CONTROL OF ODOR FROM RECOVERY UNITS BY DIRECT-CONTACT EVAPORATION SCRUBBERS WITH OXIDIZED BLACK LIQUOR. *TAPPI, 56(1):83-86, Jan. 1973. 3 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Environmental Conference, Houston, Tex., May 14-18, 1972.)*

The 20-year history of black liquor oxidation is reviewed and the present two-stage system is described. Perfromance has constantly exceeded 99% oxidation efficiency. Factors affecting efficiency are discussed. The effect of odor control has been constantly measured for a 6-month period. Data are presented demonstrating the ability of the evaporative scrubber to lower reduced sulfur emissions as much as 95% and sulfur dioxide emission from 50-80%. The advantages of the high-efficiency black liquor oxidation method of reducing recovery odors are summarized. (Author abstract modified)

29261 **APTIC NO. 51289**

Parikh, P. G., R. F. Sawyer, and A. L. London

POLLUTANTS FROM METHANE FUELED GAS TURBINE COMBUSTION. *J. Eng. Power, 95(2):97-104, April 1973. 14 refs. (Presented at the American Society of Mechanical Engineers, Winter Meeting, Annual, New York, Nov. 26-30, 1972, Paper 72-WA/GT-3.)*

The emission of carbon monoxide, hydrocarbons, and nitrogen oxides from methane fueled gas turbine combustion, the effects of overall equivalence ratio and fuel injection velocity on combustor performance and emissions of CO and hydrocarbons, and effects of operating variables on NOx formation and emissions were investigated. The local equivalence ratios in the primary zone strongly influenced emission levels of CO and NO. Lean local equivalence ratios reduced both CO and NO values; regions of stoichiometric combustion produced high local NO concentrations. Increasing the homogeneity of the primary zone gas composition by using gaseous or prevaporized liquid fuels was an effective control for NOx emissions.

29262 **APTIC NO. 51585**

Peters, James M.

PREDICTING EFFICIENCY OF FINE-PARTICLE COLLECTORS. *Chem. Eng., 80(9):99-102, April 16, 1973. 11 refs.*

A simple graphical method for predicting small-particle capture by dust and fly ash collectors was developed. The mathematical calculations were applied to test the efficiency of electrostatic precipitators, venturi scrubbers, and fabric filtration. The configurations of the collectors and the calculated efficiency curves are included.

29263 **APTIC NO. 51316**

Peters, Werner and Hans-Dieter Schilling

THE DEVELOPMENT OF THE PRIMARY ENERGY CONSUMPTION AND FUTURE MEANS OF REFINING AND APPLICATION OF HARD COAL. *(Die Entwicklung des Primaerenergieverbrauchs und zukuenftige Moeglichkeiten der Veredlung und Verwendung von Steinkohle). Text in German. Chemiker-Ztg. (Heidelberg), 97(6):277-288, 1973. 68 refs.*

The rapidly increasing demand for primary energy sources and the decreasing reserves of oil and natural gas are discussed. Only the enhanced use of nuclear energy and coal can meet the energy crisis. Decreased fuel reserves cause the importation of fuel by many countries, including Germany. Processes to treat hard coal are discussed including coal gasification. New possibilities in coke production, electricity generation, activated coal production, and gasification of coals by means of heat from high-temperature nuclear reactors are discussed. The reduction of air pollution has been a main concern for the new processes. For example, the entire process of manufacturing uniformly shaped coke by Bergbau-Forschung and Lurgi takes place in an entirely enclosed system so that dust emissions are avoided. For power production, hard coal may be fed into a fluidized bed furnace. The combustion takes place at lower temperatures which produces considerably less nitric oxide. Moreover, it is feasible to bind the sulfur in the fluidized bed by the addition of small amounts of dolomite. Tests with coals with a sulfur concentration of 4.5% have shown that the SO2 concentration becomes 500 ppm after the addition of 3400 ppm of dolomite.

29264 **APTIC NO. 51556**

Reigel, S. A., R. P. Bundy, and C. D. Doyle

BAGHOUSES- WHAT TO KNOW BEFORE YOU BUY. *Pollut. Eng., 5(5):32-34, May 1973.*

With the advent of stricter emission standards designed to produce a national quality standard of 75 micrograms/cu m of particulates, only the most efficient removal devices will be suitable. The baghouse traditionally yields high removal efficiencies of about 99.9%. Various baghouse types such as shaker type, reverse flow, reverse jet, and reverse pulse baghouses are discussed. Filtering bags, the most important components of any baghouses, are discussed. The highest maintenance component of a baghouse is the bags. The bags represent 20 to 40% of the equipment cost and have average life of 18 to 36 months. The baghouses are one of the most expensive solutions and require the most space for installation. Various recommendations for the purchase of a baghouse are presented.

29265 **APTIC NO. 51034**

Rossnagel, W. B.

THE NEED FOR Q.C. IN THE AIR POLLUTION CONTROL EQUIPMENT INDUSTRY. *Preprint, American Society for Quality Control, Milwaukee, Wis., 6p., 1973. 8 refs. (Presented at the American Society for Quality Control, Washington Section, Arlington, W. Va., March 14, 1973.)*

Problems and risks buying incinerators, scrubbers, cyclones, baghouses, electrostatic precipitators, and absorption equipment are discussed. Specific quality control problems for the equipment are described. Twelve ground rules to minimize problems in buying air pollution control equipment are presented. Costs, operating variables, guarantees, schedules, and other factors are mentioned.

29266 **APTIC NO. 51379**

Sakamoto, Kiyoaki and Nobuyoshi Hozyo

AUTOMOTIVE ENGINE MATERIALS MEETING POLLUTION CONTROL. *(Kogaitaisakumen kara mita enjinyo kinzokuzairyo). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(4):331-334, April 1973. 3 refs.*

Metal materials that can cope with the problem of valve recession resulting from the use of no-lead fuel, those suitable for thermal reactors and catalytic converters, and those materials and processes designed to prevent or alleviate pollution problems in manufacturing plants, are generally discussed. The general trend toward solution of the valve recession problem is development of anti-abrasion alloys, the materials to make the valve seat insert. A steel or non-ferrous alloy can be processed by means of casting, forging, cutting, and powder metallurgy. The sintered alloy is advantageous in both durability and economy, and is now most widely used. For reinforcement of the valve itself, various surface-coating measures are being taken including aluminum metallizing, lead nickel or chromium plating, or metal filling, none of them are sufficiently effective, however. Thus, the countermeasures to prevent valve recession are centered around the valve seat. The main requirement for the thermal reactor materials include casting and welding workability, oxidation, corrosion, and erosion-resistivity lasting for 80,000 km or more engine operation and high heat-resistance. Ferrite materials, Austenite materials, and the nickel-base materials are listed as thermal reactor materials. As measures to prevent pollution problems in manufacturing processes, material change from lead-free cutting steel to sulfur or calcium-free cutting steel, gas carbonitriding process for surface hardening, or development of new materials that do not need the surface treatment, are considered.

29267 **APTIC NO. 51516**

Sakurai, Hiroshi

THE IMPROVEMENT OF ENVIRONMENT IN ASBESTOS MANUFACTURING INDUSTRY. *(Sekimen kojo no kankyo kaizen). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 11(1):23-35, April 1973. 9 refs.*

The amount of suspended dust in an asbestos manufacturing factory was 10% by weight of the total dust, suggesting that the asbestos-containing dust may scatter more easily and stay in the air longer. Duct diameters were increased, double ducts were used, baffles were placed in the duct s center, and a double throttle hood was used to increase dust discharging from the duct. Hoods should be provided for all dust sources. The exhaust equipment should be able to reduce asbestos dust concentration outside the hood to less than 2 mg/cu m. Various dust collectors, hoods, and exhaust systems are described with photographs and diagrams.

29268 **APTIC NO. 51364**

Santoleri, J. J.

CHLORINATED HYDROCARBON WASTE DISPOSAL AND RECOVERY SYSTEMS. *Chem. Eng. Progr., 69(1):68-74, Jan. 1973. 9 refs.*

The air pollution problems created by chlorinated hydrocarbon waste in chemical plants are discussed. Several systems for eliminating major pollution problems and economical ways for recovering and reusing waste liquids are described. An incineration system designed by Nittetu Chemical Engineering Ltd. of Tokyo, Japan is described. The Nittetu system is based on the thermal vortex burner for the incineration process and the thermal submerged exhaust system for quenching the exhaust gases by direct contact of the gas with liquid. With this system it is possible to recover hydrochloric acid at a lower concentration than an azeotropic composition (about 18%) or at a higher concentration than this concentration (about 35%), or even as anhydrous HCl gas.

29269 **APTIC NO. 51171**

Searles, R. A.

POLLUTION FROM NITRIC ACID PLANTS. PURIFICATION OF TAIL GAS USING PLATINUM CATALYSTS. *Platinum Metals Rev., 17(2):57-63, April 1973. 9 refs.*

Emissions of nitrogen oxides from nitric acid plants and their control were examined. Methods for NOx reduction in tail gases include absorption, adsorption, catalytic combustion, and catalytic reduction. The catalytic method is based on the reaction of NOx with a fuel over a platinum catalyst to give colorless and harmless nitrogen and water. The process reactions, reducing conditions, catalyst forms, and method efficiency and application are examined.

29270 **APTIC NO. 51709**

Searles, R. A.

CATALYST CUTS COSTS BY REDUCING TEMPERATURE FOR INCINERATING PLANT ODOURS. *Process Eng., p. 100-102, Feb. 1973. 6 refs.*

Newly developed catalysts for use in incinerators to reduce odors are described. The causes of odors are reviewed. The catalytic incinerators, catalyst systems, and ceramic honeycombs are described; their designs and operating variables are given. The catalysts allow incineration of unpleasant process odors at much lower temperatures than with thermal incineration. Costs of the process are considered.

29271 **APTIC NO. 51517**

Shigeta, Yoshihiro

THE HISTORY OF A BAD ODOR STUDY IN THE JAPAN ENVIRONMENTAL SANITATION CENTER (1). *(Nippon kankyo eisei senta ni okeru akushu kenkyu no ayumi (1)). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 2(10):53-58, March 1973.*

An olfactometer to measure bad odors was developed consisting of an acid-alkali cleaning vessel, an activated carbon adsorbent, muffle heater combustion deodorization equipment, and a Biofilter. Large scale odor concentration equipment for treatment of odors prior to gas chromatographic analysis were studied. Ozone deodorization equipment, ion exchange resin deodorization equipment, and platinum catalyst deodorization equipment were also developed. A deodorization test using ozone showed that 85% of the amines were removed, 97% of the dimethyl amine, and 23% of the ammonia. The deodorization using an ion exchange resin showed at 60-63% removal rate for trimethyl amine and ammonia and a 20-30% rate for other amines. In the deodorization with a platinum catalyst, 60% of the amines were removed.

29272 **APTIC NO. 51568**

Slack, A. V.

REMOVING SO2 FROM STACK GASES. *Environ. Sci. Technol., 7(2):110-119, Feb. 1973.*

Full-scale and prototype processes for the removal of sulfur dioxide from stack gases are reviewed with respect to stage of technological development, process design and operation, advantages, disadvantages, and economic feasibility. The processes reviewed include absorption on metal oxides, the alkalized alumina process, the manganese oxide process, lime-limestone injection, magnesia absorption adsorption on activated carbon and molten salts, wet scrubbing with alkalis, absorbtion by ammonia, sodium-based methods, and catalytic oxidation with by-product recoveries of sulfur, sulfuric acid, liquid SO2, and gypsum.

29273 **APTIC NO. 51538**

Soo, S. L.

POWER EFFICIENCY FOR DUST COLLECTION. *Environ. Sci. Technol., 7(1):63-64, Jan. 1973. 4 refs.*

A power efficiency for dust collection devices was introduced for their evaluation along with the collection efficiency. Examples were given of the comparison of efficiencies for various dust collection devices including cyclone separators, venturi scrubbers, and electrostatic precipitators. Blower efficiencies, pump efficiencies, and the pressure drop of the gas and liquid used are defined. The power efficiency is based on the second law of thermodynamics, but is not to exceed 100%.

29274 **APTIC NO. 51693**

Stewart, Richard D., Jack E. Peterson, Terrance N. Fisher, Michael J. Hosko, Edward D. Baretta, Hugh C. Dodd, and Anthony A. Herrmann

EXPERIMENTAL HUMAN EXPOSURE TO HIGH CONCENTRATIONS OF CARBON MONOXIDE. *Arch. Environ. Health, 26(1):1-7, Jan. 1973. 9 refs.*

Six healthy male human volunteers were exposed to seven high carbon monoxide concentrations ranging from 1000 ppm for 10 min to 35,600 ppm for 45 sec. The CO was rapidly absorbed, and the increase in percent carboxyhemoblobin (COHb) saturation in venous blood per liter of CO mixture inhaled could be accurately predicted by the equation, log (delta % COHb/l) equals 1.036 log (ppm CO inhaled)-4.4793. The abrupt increase in COHb concentration of 11.6% and 9.1% saturation in two subjects produced the immediate onset of mild frontal headache. The subject exposed to 35,600 ppm demonstrated slight sagging of the ST-segment of lead II during cardiac monitoring. This occurred 20 sec after the exposure had started and persisted for 10 min after exposure. Neither the spontaneous nor the evoked electrical activity of the brain exhibited significant changes which could be attributed to CO exposure over the range studied. (Author abstract)

29275 **APTIC NO. 51523**

Tamagawa, Takeo and Toshiichi Baba

SULFONATION OF MANGANESE NODULE BY EXHAUST SMOKE FROM A FACTORY. *(Kojo haien ni yoru mangan nojuru no ryusanka). Text in Japanese. Preprint, Mining and Metallurgical Inst. of Japan, Tokyo, p. 311-312, 1973. (Presented at the Mining and Metallurgical Institute of Japan, Spring Meeting, Tokyo, Japan, March 29-April 1, 1973, Paper 4515.)*

Manganese dioxide nodules were sulfonated and roasted using stack gas containing nitrogen dioxide to desulfurize the exhaust gas and recover valuable metals such as copper, nickel, and manganese. The exhaust gas tested was composed of 0.2% sulfur dioxide, 3% oxygen, 10% water, 13% carbon dioxide, and 73.8% nitrogen. The manganese nodule contained 24.33% Mn, 10.97% iron, 1.05% Ni, 0.63% Cu, 16.81% silica, and 18.3% H_2O. About 29 g of the sample was placed in a reactor tube; the air in the tube was replaced by N_2 gas; when a desirable temperature was reached, the exhaust gas was admitted to the system. The SO_2 was monitored at the inlet and outlet. The desulfurization was effective at 400-600 C and at a gas volume rate of 3000/hr. The selective separation of copper and nickel by the sulfonation of the manganese nodule with exhaust smoke was small.

29276 **APTIC NO. 51431**

Tanaka, Nobutoshi, Kazutaka Makino, and Koichi Iinoya

THEORETICAL ANALYSIS OF CONTINUOUS-RENEWAL TYPE AIR FILTER. *J. Chem. Eng. Jap., 6(1):102-104, Feb. 1973. 2 refs.*

A theoretical analysis of a continuous-renewal type air filter is presented and compared to that of a partial-renewal air filter. Various computations were carried out, using a mathematical model (partial differential equations) which was derived in the same manner as the model for the partial-renewal filter. Both the continuous-renewal type and the partial-renewal type filters were compared to the constant type filter. The renewal velocity was estimated with the mathematical models. The continuous renewal type of air filter is superior to the other two from the economic standpoint of medium consumption. (Author abstract modified)

29277 **APTIC NO. 51495**

Tanaka, Tadatsugu, Fumio Yamaguchi, and Takeo Shirakura

A STUDY OF A WET TYPE CYCLONE -- THE EFFECT OF THE DIAMETER OF THE CYCLONE. *(Shisshiki saikuron ni kansuru kenkyu -- saikuron-kei no eikyo ni tsuite). Text in Japanese. Preprint, Mining and Metallurgical Inst. of Japan, Tokyo, p. 191-192, 1973. (Presented at the Mining and Metallurgical Institute of Japan, Spring Meeting, Tokyo, Japan, March 29-April 1, 1973, Paper 4111.)*

The influence of cyclone diameter on the pressure loss, dust collection efficiency, and required motive power was studied. Cyclones were tested with 80, 113, 135, 160, 225, and 320 mm diameter (D) inside the cylindrical portion, D/2 cylindrical portion height, D/5 inside inlet diameter, square root of 2 times D/5 and four times the square root of 2 times D/5 inside diameter of the overflow finder, and D/5 and D/5 times the square root of 2 inside diameter of the underflow nozzle. Fine crude lime powder was the test dust. For a wet cyclone, the diameter had less influence on performance than the opening ratio.

29278 **APTIC NO. 51296**

Tate, Roger W.

SPRAY NOZZLES FOR POLLUTION CONTROL. *Pollut. Eng., 5(4):42-44, April 1973.*

The design and operation of spray nozzles and their application to pollution control are reviewed. Spray nozzles atomize liquid into small droplets, disperse it in a specific pattern, and regulate the flow discharged through the nozzle. Nozzles may be classified as hydraulic, pneumatic, or a combination of both. Applied to pollution control, they can be used in cleaning and rinsing contaminated industrial equipment, wet scrubbing of industrial emissions, spray drying, evaporative cooling for electrostatic precipitators or baghouses, spray aeration, effluent water cooling, oil slick removal, spray irrigation, ground application of pesticides to avoid dispersion, aerial spraying, electrostatic painting, noise attenuation, water and fuel injection in engines and gas turbines, fuel oil burning to minimize smoke and nitrogen oxides, and incineration for fuel injection or secondary burning.

29279 **APTIC NO. 51654**

Tohata, Heiichiro

PROBLEMS OF THE DEVELOPMENT OF DENITRATION TECHNOLOGY. *(Datsusho gijutsu kaihatsujo no shomondai). Text in Japanese. Preprint, Fuji Techno-System Inc., Tokyo (Japan), 17p., 1973. 39 refs. (Presented at the Seminar on Comprehensive Countermeasure Against Nitrogen Oxides, Tokyo, Japan, Feb. 14-15, 1973.)*

Wet and dry denitration are discussed. Wet denitration includes water absorption, absorption by vapor phase oxidation, absorption by liquid phase oxidation, alkali absorption, and absorption with a solution of inorganic salts in water. The dry denitration methods include vapor phase reaction and catalytic reduction. In the water absorption method, nitric oxide has not been detected in water, and the absorption efficiency does not exceed 5% for nitrogen oxides. In the vapor phase oxidation method, NO is oxidized by catalytic oxidation to nitrogen dioxide which is absorbed in a scrubber by water. In liquid phase oxidation, an oxidizing agent is used which can be expensive. Caustic soda as an alkaline absorber gives low absorption; calcium hydroxide does not react with NO. Ammonia absorbs NO_2 with low efficiency. Ferrous sulfate solutions can absorb some NO, but it is impossible to recover ferrous sulfate economically. In the dry denitration method, the reaction of ammonia with NO_2 causes the formation of ammonium nitrate which can be removed by an electric dust collector.

29280 **APTIC NO. 51657**

Tsuji, Soichi

COMBUSTION CONDITIONS FOR NITROGEN OXIDES AND ITS REDUCTION COUNTERPLAN. *(Chisso sankabutsu no nensho joken to sono teigen taisaku). Text in Japanese. Preprint, Fuji-Techno-System Inc., Tokyo (Japan), 34p., 1973. (Presented at the Seminar on Comprehensive Countermeasure Against Nitrogen Oxides, Tokyo, Japan, Feb. 14-15, 1973.)*

Fuel, air to fuel ratio, combustion load, combustion chamber structure, combustion temperature, and other combustion factors can affect nitrogen oxide formation. Different fuels have different combustion characteristics or radiant heat transmission characteristics, causing the flame temperature and amount of nitric oxide to vary. The air/fuel ratio causes changes in temperature and oxygen concentration, and thus in NO concentrations. Variations in the combustion load factor change the flame temperature. Combustion and burner construction affects the distribution in temperature which can cause local NO concentrations, even if the average temperature is low. In general, NO concentrations increase with temperature, oxygen concentration, and the retaining time. Lowering of combustion temperature helps control NO, but because the fuel NO can occur even at low temperatures, lowering combustion temperature is ineffective for the fuel NO.

29281 **APTIC NO. 51232**

Walther, James E., Horace Hamby III, and Herman R. Amberg

CONVERSION OF CALCIUM BASE PULPING TO MAGNESIUM BASE PULPING WITH RECOVERY. *TAPPI, 56(4):144-147, April 1973. 5 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Sulfite Pulping Conference, Boston, Mass., Oct. 30-Nov. 1, 1972.)*

The conversion of calcium base pulping to magnesium base pulping with recovery is discussed. The major areas of concern in accomplishing the changeover included spent liquor recovery, evaporation, burning liquor with chemical recovery, and digester relief recovery. A pilot plant was built to determine the effect of the new pulp on existing paper grades and to provide design data and operating experience with the magnefite process. Corrosion problems detected in the pilot plant were corrected in the plant design. Operating equipment problems during the first year included metal fatigue in the evaporators, scale formation in the venturi absorption system, and sulfur dioxide and particulate emissions. Methods for controlling these problems are described, including: a continuous monitoring system to measure SO2 stack emissions comprised of a coulometric titrator system and a stack probe filter; venturi scrubbers, flame photometric detectors, and electrochemical membranes; and filters for dust emissions. The pilot plant program and the startup procedure are also discussed. (Author abstract)

29282 **APTIC NO. 51676**

Weinaug, R. J., Jr.

EARLY EXPERIENCE WITH A LOW-ODOR RECOVERY SYSTEM. *TAPPI, 56(1):80-82, Jan. 1973. 1 ref. (Presented at the Technical Association of the Pulp and Paper Industry, Environmental Conference, Houston, Tex., May 14-18, 1972.)*

A discussion is presented of early experiences with a low-odor recovery boiler and high-solids concentrator system used in a kraft pulp mill. Boiling point rise measurements, as well as an optical refractometer are used to monitor product solids from the concentrators. Feed solids content is maintained at 50% and product solids content at 62%. The recovery boiler is designed for 850-psi, 825 F operation with 300 F feedwater burning black liquor of 62-63% solids content. An early problem, sticky dust in the precipitator, was eliminated by keeping the oxygen content of the flue gas at 2-3%. Severe pluggage at the economizer was resolved by installing a larger sootblower at the inlet and lowering the lase economizer baffle at the outlet. A superheater pluggage problem was eliminated by providing separate steam supply values for each sootblower piping system, installing larger nozzles in sootblowers, and changing the blowing medium from superheated to saturated steam. The recovery boiler should operate at rated capacity with 1 ppm or less hydrogen sulfide. However, problems which still need to be resolved include eliminating snow from the precipitator, reducing sulfur dioxide content in the flue gases, improving the dust handling system, and eliminating weld failures in the economizer. (Author abstract)

29283 **APTIC NO. 51678**

Wyllie, D. McLean

ASBESTOS FILTER SHEETS. *Filtration Separation (Purley), 10(2):175-176, 178, March/April 1973. 3 refs. (Presented at the American Institute of Chemical Engineers, Filtration Society Symposium, 2nd, Minneapolis, Minn., Aug. 27-30, 1972.)*

High permeabilities with really effective filtration can be achieved with asbestos filter sheets which are used mainly to remove microorganisms from liquids, as in beer filtration. The composition of asbestos filter sheets is described, as well as their applications and their filtration mechanisms. Health aspects of using asbestos filter sheets are considered. (Author abstract modified)

29284 **APTIC NO. 51496**

Yamanaka, Tatsuo

UTILIZATION OF CATALYST IN AIR POLLUTION CONTROL. (3). *(Kogai boshi gijutsu ni okeru shokubai no riyo (3)). Text in Japanese. Kagaku Kogyo (Tokyo), 24(6):784-789, June 1973. 4 refs.*

Nitrogen oxides can be removed from stack gases by absorption, catalytic decomposition, or catalytic reduction and oxidation. The catalytic reduction of NOx has been performed with success at factories with available gases such as hydrogen, carbon monoxide, hydrocarbons, ammonia, or a combination of these gases. The oxidation of NOx can be carried out with oxygen. In catalytic reduction, however, there are problems concerning the coexistence of oxygen, water, and sulfur dioxide and the reaction temperature. In oxidation there is a problem because the reaction rate is small. Catalysts used include metal oxides such as copper chromate, manganic oxide-ferric oxide, and manganic oxide-copperoxide and various combinations of these with alumina, platinum, palladium, rhodium, and ruthenium.

29285 **APTIC NO. 51519**

Yoda, Y.

THE IMPROVEMENT OF ENVIRONMENT IN LIME MANUFACTURING INDUSTRY. *(Sekkai kojo no kankyo kaizen (funjin sagyo)). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 11(1):9-15, April 1973. 3 refs.*

Dust is heavily discharged during the quick lime slaking process. The wet air containing the dust is cooled in the duct, thus causing wet dust to form on the inner duct walls. This closes the duct and lowers dust collection and gas exhausting efficiency. An improvement of the system was made by installing an adequate hood or wet dust collector above the limestone charging hold. A dust collector was used to collect exhaust gas from a calcinating furnace. Hood shape was improved and bag filters were installed for grinding, screening, bagging, and conveying operations. Unloading and loading operations took place in a well-ventilated area.

1972

29286 **APTIC NO. 51144**

Oil Therm A. G. (West Germany)

BLUE FLAME BURNER AND ENVIRONMENTAL PROTECTION. *(Blaubrenner und Umweltschutz). Text in German. Oel- Gasfeuerung, 17(3):1972.*

With the blue flame burner, the combustion in oil-fired boilers is divided into a gassing stage and a combustion stage. The gaseous fuel burns with a blue flame which means that no soot is produced at carbon dioxide concentrations of 14 to 15%. The high air velocities and air pressure with which this burner operates makes it a noisy one, and that was the reason for its use in industrial furnaces. In the meantime, the design of this burner was modified to produce less noise so that it can also be installed into domestic oil-fired heaters.

29287 **APTIC NO. 51247**

NEWEST BRITISH COLUMBIA MARKET PULP MILL BEGINS PRODUCTION. *Paper Trade J., 156(51):26-33, Dec. 11, 1972.*

The production of long fibered pulps from interior wood for the new plant at Mackenzie is described. Optimum quality product with minimum pollution is the target for this new mill. Chip handling, pulping, and washing are discussed. The discharge gases are cleaned by a Chemico Venturi Scrubber to remove particulate matter before going to the discharge stack. There is a mill side system of collection sumps, reclaim pumps, and conductivity alarms to reclaim and/or prevent losses of liquor and fiber. The effluent treatment is designed for 80% biological oxygen demand removal and includes primary and secondary treatment plus a spill pond capable of holding 16 hr of mill effluent and returning to treatment at a controlled rate. To prevent particulate carry over the form of salt cake dust, an S. F. electrostatic precipitator has been installed with a 99.5% efficiency rating. Odors and gases are condensed and scrubbed.

29288 **APTIC NO. 51345**

HOW AMALGAMATED ROADSTONE REDEVELOPED THEIR CRAIG-YR-HESG QUARRY. *Mine Quarry, 1(7):9-10, 12, Nov. 1972.*

A redevelopment scheme, costing upwards of one million dollars and involving the provision of new crushers, advanced dust control equipment, improved access roads, landscaping, low bench working and multi-row blasting is described. Craig-yr-Hesg produces a blue pennant gristone of exceptional quality. In planning the redevelopment, particular attention has been paid to environmental considerations. Over $25,000 has been spent to incorporate efficient dust control equipment. Drainage and surfacing works have been carried out on large areas of the quarry floor, to prevent formation of mud ponds in winter and dust bowls in summer, and new main drains now take all surface water away from the quarry, after suitable settling treatment to remove silt.

29289 **APTIC NO. 51373**

DUST COLLECTION PLANTS. *Cement Technol., 3(6):229-232, Nov./Dec. 1972.*

Three systems of dust collection are available to industry: electrical dust precipitation, cyclone dust collection, and wet-type dust collection, which includes water injection into fans, water-sprayed filter beds, and venturi gas cleaners. Electrical precipitators are extremely reliable, have low power consumption because of low draft loss, and reach collection efficiencies of nearly 100%. In the cement industry, efficiencies of 99.8% have been achieved in collecting dust from hot and dry gases discharged from rotary kilns. More than 90% of such dust consists of particles smaller than 10 micron. Cyclones are of straighforward design, readily protected against wear, and highly effective with particles between 10-20 micron. Wet dust collection is sometimes used in the form of a combined dry/wet system; this system is advocated where stringent regulations apply to the dust content of flue gases, especially if the necessary effluent treatment plant is already available. By injecting water into suitably designed fans or by using water-irrigated filter beds, the dust content of flue gases is reduced substantially. Particles under 1 micron are extracted by venturi cleaners with 90-99% efficiency.

29290 **APTIC NO. 51530**

NANTICOKE STRESSES CLEAN AIR OPERATION. *Mod. Power Eng., 66(12):54-55, Dec. 1972.*

Air quality control equipment at an Ontario thermal electric station (4000 Mw) on Lake Erie includes two 655-foot chimney stacks with a four-flue design that greatly reduces sulfur dioxide fallout in the surrounding area, as well as efficient fly ash collection, handling, and removal equipment. Electrostatic precipitators remove 99.5% of particulate matter from flue gases before they enter the stacks. Removal of fly ash is accomplished by vacuum systems which take ash from hoppers through conveyor pipes to hydraulic vacuum producers. The fly ash is mixed with water and the resultant slurry flows by gravity to an ash lagoon. Automatic controls on the removal equipment eliminate the need for operator attention; removal time when burning coal with 10.4% ash content is 11 hr/day/unit. Cooling water is obtained from tunnels cut into the bottom of Lake Erie. Sixty percent of the water goes to condensers, where it cools the steam and returns to the lake. The remaining 40% is mixed with water and returned to the lake 5-15 deg warmer than when obtained from the lake bottom. Computers at the plant carry out alarm scanning for safe and efficient operation, in addition to monitoring coal flow and the generators.

29291 **APTIC NO. 51547**

SULPHUR REMOVAL IN FUEL OIL COMBUSTION. *Petrol. Rev., 26(311): 333-336, Nov. 1972.*

The chemically active fluidized bed (CAFB) process for desulfurizing fuel oil at the furnace is described to solve the problem of pollution by sulfur dioxide emissions in the flue gas. The Environmental Protection Agency considers that the CAFB process shows good promise for reducing SO2 emissions from large power stations burning the high sulfur heavy fuel oils which are essential to the economical production of electricity in the U. S. and in many other countries such as Britain. Results indicate that the CAFB process should offer some cost advantage over other means for reducing the burden of SO2 in the air. The total development program is aimed at the conversion of a 100 megawatt power station in the U. S. The technical outline of the process comprising various stages are described. The fluidized bed contains lime particles into which fuel oil is injected. The oil is gasified, and the bed absorbs the released sulfur dioxide.

29292 **APTIC NO. 51601**

Assoc. for the Promotion of Machinery (Japan), New Machinery System Center

PROGRESS TOWARD A POLLUTIONLESS ECONOMIC SYSTEM. *(Datsukogai keizai shisutemu e no sekkin). Text in Japanese. 161p., May 1972.*

Studies were made for an approach toward a pollutionless economic system using system simulations. Paper and pulp industries were used for case studies. Waste liquid and flue gas desulfurization system models were constructed. The 1969 waste liquid and sulfur dioxide emission per source unit figures were projected to 1959 and 1975, emission standards were established by the 1959 figures, and the treatment cost estimates for a pulp and paper plant with a daily production of 500 tons were obtained by superimposing the SOx emission figure of 1959 on the total emission of 1975. If emission source unit cost does not increase any more after 1969, in order to reduce the amount of 1975 SO2 emission to the point of 1959, the sulfur emission/kl of fuel oil will have to be reduced to 0.44%. The treatment cost/kl of fuel oil is approximately $3.70 to $4.70 by desulfurization of stack gas; but if low sulfur fuel is used, the cost will be close to $10/kl of oil. Desulfurization of stack gas is obviously advantageous from the standpoint of cost. However, for industries other than paper pulp, the cost for by-products of SO2 desulfurization must be taken into consideration. In kraft pulp processing, scrubbers and electrostatic precipitators are used for the recovery boiler; scrubbers, electrostatic precipitators and stack gas desulfurization are used for lime kilns; scrubbers are used for the disolver, and low sulfur fuel and stack gas desulfurization are used for boilers for producing steam. Six factories of paper and pulp industries recover sodium sulfite.

29293 **APTIC NO. 51697**

ELECTRO-MOTIVE S PROGRAM FOR REDUCING EXHAUST EMISSIONS. *Diesel Gas Turbine Progr., 38(12):28-29, Dec. 1972.*

The current diesel exhaust emission program developed for a manufacturer of diesel-electric locomotives consists of two interlocking phases. One centers around design and testing of new engine components to reduce emissions. The other, concerned with measurement and analysis of exhaust gas and smoke, includes development of new measuring and sampling techniques. Attempts to reduce exhaust emissions from the two-stroke cycle diesel engines, mostly used for locomotives, are described. The newly developed engine components are described and locomotives equipped with the new components were tested for smoke level and for exhaust emissions.

29294 **APTIC NO. 51713**

Joint ENEA/IAEA International Liaison Group on MHD Electrical Power Generation

MHD ELECTRICAL POWER GENERATION. 1972 STATUS REPORT. *At. Energy Rev., 10(3):301-377, 1972. 144 refs.*

The extensive research, development and construction programs conducted in many countries have shown that the magnetohydrodynamics (MHD) method of power conversion offers great possibilities for power generation with increased efficiency, minimum cost per installed kilowatt, and the promise of substanial reduction of harmful effects on the environment. The MHD power generation is entering a new stage of development. The first large pilot plant incorporating all the components of future MHD electrical power stations was designed for an MHD generator power of 25 MW(e) and went into operation in the Soviet Union in March 1971. The principal theoretical, experimental, and developmental results obtained in various countries and gives current views on the prospects of MHD power generation in different areas of possible application are reviewed. The three basic types of MHD plants are open-cycle plants, closed-cycle plants with a plasma MHD generator, and closed-cycle plants with a liquid-metal MHD generator. Superconducting magnetic systems are discussed. The national MHD development programs of some leading countries are reviewed. The major efforts are being made in this field, activities planned for the next few years, and various problems still awaiting solution are discussed. (Author abstract modified)

29295 **APTIC NO. 51720**

Bakr, M. Y. and M. Hussein

PRODUCTION OF FLUOSILICATES FROM WASTE GASES OF EGYPTIAN SUPERPHOSPHATE INDUSTRY. *Indian Ceram., 16(6):111-114, Sept. 1972. 4 refs.*

The chemical analysis of Egyptian phosphate rock shows the fluorine content to be 3.3%. About 30% of the fluorine present in the rock is evolved during acidulation with 70% sulfuric acid. Silicon tetrafluoride is evolved as a gas during acidulation of phosphate rock with H2SO4, which reacts with water to produce an aqueous solution of fluosilicic acid. This solution is the starting material for preparation of the different metal fluosilicates. Experiments were made on the preparation of sodium and calcium fluosilicate by neutralizing fluosilicic acid with various sodium and calcium salts. Sodium and calcium chlorides are the preferred salt solutions. (Author abstract modified)

29296 **APTIC NO. 51178**

Bettelheim, J., R. H. M. Billinge, and A. C. Collins

AREAS OF TECHNICAL UNCERTAINTY IN SOME SULPHUR DIOXIDE REMOVAL PROCESSES. *Process Technol. Int., 17(12):939-940, Dec. 1972. 12 refs.*

Further progress in a number of processes for removal of sulfur dioxide from flue gases in inhibited by a lack of basic data. In the ammonia washing process involving absorption of SO2 in an aqueous ammonium sulfite-bisulfite solution, the basic mass-transfer mechanism is not mathematically quantified. In magnesium salt regenerative methods, all based on the low solubility of magnesium sulfite hydrates in water, relevant information is needed on control of the crystallization process. The danger of poisoning of the vanadium-based catalyst by arsenious oxide has not been specifically eliminated by the Cat-Ox process for SO2 oxidation followed by production of 70-80% sulfuric acid. The economics of carbon sorption processes are limited by the thermal regeneration step, which results in chemical and physical loss of carbon. The main problem of the Alkalized Alumina process is deterioration of the sorbent, a porous form of sodium aluminate, by chemical and physical stresses. This situation may be improved by catalyst addition to lower regeneration temperatures, and use of an initially less active material to reduce the rate of physical change. (Author conclusions modified)

29297 **APTIC NO. 51344**

Bryson, Frederick E.

REBIRTH OF THE PLASTIC CAR? Machine Design, 44(30):22-26, Dec. 14, 1972.

The 1975 Federal emission and impact standards will effect the use of plastics in the automotive industry. Corrosion resistance, weight saving, and cost reductions are obtained with the use of plastics in the automobile bodies. The biggest volume of plastic used in the future will be in body panels. The emission-control devices will increase under-hood design temperatures as much as 350 F, which is 150 F higher than when plastics first appeared in the engine compartment. This increase will eliminate most reinforced resins from these applications. The trend toward stiffer environmental and safety regulations will push auto makers toward greater use of plastics.

29298 **APTIC NO. 51323**

Christensen, B.

RORDAL CEMENT WORKS, AALBORG, DENMARK. *Cement Technol., 3(6):207-214, Nov./Dec. 1972.*

A wet process plant was chosen for the latest extension to Denmark s largest cement works, partly because of the high moisture (25%) content of the raw materials and also because of low production costs. Chalk and clay are processed in wash drums and wash mills, respectively, and ground together to a slurry in tube mills. The principle of continuous homogenization is applied for kiln slurry. Three new wet kilns, one of which is equipped with fittings for efficient heat recuperation, give the works a clinker production rate of 7000 tons/day. Each kiln has a separate coal mill and coal dust hopper from which coal is fed to the kiln through a closed-in type of feeder. The air used for drying in the coal mills serves as primary air in the respective kilns. Kiln dust is precipitated by electrostatic precipitators into an alkali-rich fraction and a fraction suitable for return to the kiln. The first fraction is washed with sea water and pumped to an abandoned clay pit. The other fraction is split into two streams that are returned, respectively, to the side intake and burning zone of the kiln. The operation of the new plant, including wash drums and slurry mills, kilns, clinker store, and cement mills, is controlled from a central room equipped with a digital-analog-process control system. Despite the higher fuel consumption of the wet kilns, the cost of wet processing compares favorably with that of dry process installations.

29299 **APTIC NO. 51349**

Iya, K. Sridhar

REDUCE NOX IN STACK GASES. *Hydrocarbon Process., 51(11):163-164, Nov. 1972. 4 refs.*

Nitrogen oxides pollution is a major concern for the hydrocarbon processing industry. About 60% of all nitrogen oxide emissions come from burning fossil fuels in stationary heaters and furnaces like those used in this industry. Various methods to cut the emissions are discussed. The principal chemical reactions responsible for forming nitrogen oxides are presented, and the kinetics of formation of nitrogen oxides are studied. The NOx equilibrium concentration increases sharply with flame temperature. Type and composition of fuel, rates of heat release and heat loss, amount of excess combustion air, and mixing and distribution of fuel/air in combustion chamber influence NOx emission in a combustion system. Flue gas recirculation, low excess air firing, water or stream injection, two-stage combustion, and combinations of these techniques are described for reducing NOx emission. Catalytic treatment of flue gas to reduce NOx emissions is also described.

29300 **APTIC NO. 51261**

Klochkov, V. N. and V. F. Nerubenko

THE CHARACTERISTICS OF CONDENSATE SOLUTIONS OF CO2. *Thermal Eng. (English translation from Russian of: Teploenergetika), 19(5):20-21, May 1972. 3 refs.*

A simplified method of calculating the pH in condensate solutions of carbon dioxide is described. The calculation of hydrogen ion concentration with an accuracy to the fourth place is avoided by using approximate values of the thermodynamic dissociation constants of CO2 with three significant figures. The results of calculation for 20 and 50 C which are the most extensively applicable temperatures for the power industry are presented. Substitution of these data in the more accurate equation showed completely satisfactory agreement.

29301 **APTIC NO. 51330**

Michaud, Robert L.

SUPER CENTRAL PLANT SUPPLIES STEAM, CW TO MINNEAPOLIS. *Heating, Piping, Air Conditioning, 44(13):43-51, Dec. 1972.*

A combined heating and cooling central plant which sells steam and chilled water to commercial customers in Minneapolis is described. The energy center has a capacity of 400,000 lb/hr of steam and 10,000 tons of refrigeration, with space available to expand the facility to 1.2 million lb/hr of steam and 22,000 tons of cooling. The area served by the central plant, plant design, central equipment consisting of boilers and water chillers, engine installations, and distribution systems are reviewed. The boilers are equipped with oil burners which enable compliance with local air pollution regulations under varying atmospheric conditions on about 110 days a year oil is fired. The plant chillers are equipped with centrifugal and absorption units. Problems connected with the system startup are also discussed.

29302 **APTIC NO. 51667**

Noso, Shigeyuki, Katsunoshin, Kobayashi, and Sakae Yamaguchi

ON ELECTROSTATIC PRECIPITATOR OF THE OIL FIRED BOILER FOR THE TOYAMA SHINKO KYODO POWER STATION. *(Toyama Kyodo Karyoku Hatsuden Kabushiki Saisha Toyama Shinko Kyodo Hatsudensho dono nonyu juyu sensho boirayo ammonia chunyu sochitsuki denki shujin sochi). Text in Japanese. Sumitomo Jukikai Giho (Sumitomo Shipbuilding Machinery), 20(59):91-95, Oct. 1972.*

For the control of air pollution, sulfuric acid corrosion of the flue structure, and acid smut, an electrostatic precipitator with an ammonia adding device was designed for a thermal power plant in Toyama. With the addition of ammonia, the dust particle size decreases and the proportion of less-than-10 micron particles increases from 70% to 90%. Electric resistance increases about 100 times, and the dust quantity also increases considerably. In designing this system, oil mist separators, air mixture heaters, and nozzle tube ammonia flow monitoring manometers were installed; perfection of a flame arrester, prevention of nozzle low temperature corrosion, and even an adequate distribution of ammonia were particularly given consideration. The dust collection rate was designed to be 80%, but actual records show 96.80-97.71% collection rates.

29303 **APTIC NO. 51543**

Pring, Robert T.

SPECIFICATION CONSIDERATIONS FOR FABRIC COLLECTORS. *Pollut. Eng., 4(9):22-24, Dec. 1972.*

Fabric collectors and baghouses embrace a wide variety of gas cleaning equipment in which solid particulates are separated from the air stream by fabric media. Typical fabric collectors include: proprietary modular or standard collectors; variations of standard equipment to accommodate special requirements of capacity, operating environment, maintenance; special heavy duty collectors of modular design; and custom designed structural baghouses. Filter bag design factors are tabulated. Filter media, filter cleaning devices, collection receptacles, an isolation enclosure, an air handling device, and controls in fabric collector are discussed. Advantages and disadvanges of a pressure baghouse are described.

29304 **APTIC NO. 51685**

Purohit, Gopal R.

NITROGEN OXIDE POLLUTION. *Chem. Age India, 23(9):725-730, Sept. 1972. 9 refs.*

Nitrogen oxides are emitted from the exhaust of mobile sources, unprocessed tail gas from nitric acid industries, and other processes such as the nitration of organic compounds and dissolution of metals in nitric acid. The major emission sources are large nitric acid plants whose tail gas contains 2000-3000 ppm NOx. The most attractive method of reducing the oxides below 300 ppm is catalytic combustion in which preheated tail gas is mixed with a reducing gas, mainly methane, and passed over a palladium or platinum catalyst. One and two-stage systems with power and/or heat recovery are described. Two-stage systems are preferred since lower outlet temperatures are possible. Alternatively, NOx can be totally removed from exhaust gases by selective reaction of ammonia over a platinum catalyst, but without power or heat recovery. Although NOx and nitric acid can be recovered from molecular sieves and silica gel adsorbents at high concentrations, adsorption is costly compared to catalytic combustion. Absorption is also uneconomical due to the high cost of absorbents (e.g., ammonium bisulfite, lime suspensions, waste caustic ammonia liquor) and the large volume of waste liquor disposal.

29305 **APTIC NO. 51577**

Shahab, Manoochehr

HYDRODESULFURIZATION OF FUEL OIL USING CO-MO CATALYSTS. *Petrol. Hydrocarbons, 7(3):195-196, Oct. 1972.*

The hydrodesulfurization process for fuel oils was investigated, and the results are reviewed. The process design, operating variables, and catalyst construction are examined. Activated alumina was used as a support for cobalt-molybdenum catalysts. Sulfur removal increased with an increase in the reaction temperature when liquid hourly space velocity was fixed and with increasing hydrogen pressure at fixed temperatures and decreased with the aging catalyst. Vanadium and other heavy metals were effectively removed from the oil to elongate the life of the catalyst.

29306 **APTIC NO. 51177**

Stettenbenz, L. W.

POWER-RECOVERY GAS EXPANDER GAINS IN FCC CYCLE. *Oil Gas J., 70(51):60-67, Dec. 18, 1972. 6 refs. (Presented at the West Gas Processors and Oil Refiners Association, Annual Fall Meeting, 47th, Newport Beach, Calif., Oct. 1972.)*

The relationship between power recovery and environmental control in refineries is examined. In a typical catalytic-cracking installation, a third stage cyclone and power-recovery expander are placed between the regenerator and carbon monoxide boiler. The purged gas becomes capable of supplying up to 20,000 hp to the compressor and steam turbine. In addition, removal is near total for spent catalyst particulates from flue gas before entering the expander. This greatly eases the burden on downstream precipitators and scrubbers, enabling compliance with restrictions limiting contaminants to 40 lbs/hr and codes specifying Ringelmann No. 1 criterion. A plant installing a 12,100 hp expander at a cost of $1,360,000 should realize a return of $6,609,686 in 10 years. Important considerations in the selection of a power-recovery system are placement of the expander, staging (number of blade rows), materials, and design of rotor assembly.

29307 **APTIC NO. 51675**

Suwa, Tasuku

TENDENCY OF AIR POLLUTION BY SULFUR OXIDES IN JAPAN AND ITS COUNTERPLAN. DESULFURIZATION OF STACK GAS. *(Io sankabutsu ni yoru taiki osen no keiko to sono taisaku, haien datsuryu). Text in Japanese. Sanyo Gijutsu Zasshi (J. Sanyo Assoc. Advan. Sci. Technol.), 26(1):5-11, June 1972. 10 refs.*

As air pollution control measures, the envorcement of emission standards, the control of automotive emissions, the establishment of monitoring network, and the promotion of stack gas desulfurization techniques are discussed. Pollutant control plans for mining areas, the use of low-sulfur fuels, collectivization of stacks, installation of high performance dust collectors for electric and gas industries, desulfurization of fuel oils, and collectivization of boilers and air conditioners are mentioned. The discussion of desulfurization systems includes the activated manganese oxide method, the ammonia absorption methods, caustic soda absorption methods, the potassium sulfide method, catalytic oxidation methods, and adsorption methods. The freezing method and radioactive irradiation method are briefly mentioned. In the freezing method, soots and dusts are eliminated from flue gas by dust collectors; the gas is then cooled by sea water to 20 C and to 5 C by a freezer. The steam in the flue gas is eliminated and the remaining dry gas is cooled by liquid natural gas at minus 160 C; carbon dioxide and sulfur dioxide are solidified and eliminated. The irradiation method is in the process of development. Combustion gas is put in a stainless reactor and irradiated radioactively. Aerosol and sulfuric acid mist are produced, and SO2 in the gas is reduced by 80-90%.

1971

29308 **APTIC NO. 51624**

Berkowitz, Joan B.

REVIEW OF SCALING PROBLEMS IN LIMESTONE BASED WET SCRUBBING PROCESSES. ***Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:975-982. (Nov. 8-12.)***

Scaling problems involved in limestone based wet scrubbing processes for the removal of sulfur dioxide are reviewed with respect to the basic mechanisms of scale formation, process design, the effects of various operating variables, scale composition, and scale control. The major variables affecting scale formation, and therefore scale control, include the supersaturation behavior in calcium sulfate and sulfite solution, pH value, and scrubber design.

29309 **APTIC NO. 51007**

Bourbon, P., J. Alary, J. Esclassan, and F. Alengrin

CONTRIBUTION TO THE MEASUREMENT OF THE OXIDES OF NITROGEN (NO, NO2) BY THE GRIESS-SALTZMANN METHOD. ***(Contribution du dosage des oxydes d azote (NO, NO2) par la methode de Griess-Saltzmann). Technicon Symp., Automation Anal. Chem., Paris, France, 1971. Translated from French, 34p.***

The Griess-Saltzmann method was adapted to the determination of significant concentrations of nitric oxide and nitrogen dioxide in exhaust pipes, central heaters, ammonia production units, and chimney flues. The NOx concentrations varied from several to several hundred ppm. Specifically, the capture efficiency of the reagent, the quantity of NO released in the reaction of NO2 with the absorbing reagent, the oxidation of NO to NO2, and the conversion factor were examined. Sampling, instrumentation, standardization procedures, and analytical techniques are reviewed.

29310 **APTIC NO. 51628**

Burns, E. A. and A. Grunt

ON-STREAM CHARACTERIZATION OF THE LIMESTONE/DOLOMITE WET SCRUBBER PROCESS. ***Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:1053-1071. (Nov. 8-12.)***

Analytical methods for continuous on-line slurry sampling and separation were examined to determine their applicability toward testing of the wet limestone scrubbing processes. Analytical instrumental methods with the capability of continuous or slug flow analysis within 2 min were identified for characterization of the separated solid matter and liquor. The methods selected for the analysis of solid constituents for sulfur, calcium, magnesium, and iron contents and of the liquid phase for acidity, sulfite, sulfate, calcium, magnesium, and carbonate contents included colorimetry, atomic absorption spectrophotometry, electroconductivity analysis, infrared spectrometry, turbidimetry, and X-ray spectrometry.

29311 **APTIC NO. 51464**

Butze, Helmut F.

METHODS FOR REDUCING POLLUTANT EMISSIONS FROM JET AIRCRAFT. ***National Aeronautical and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA TMX-68000, 16p., 1971. 6 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, 92nd, Washington, D. C., Nov. 28-Dec. 2, 1971.)***

NTIS: N72-18009

Control methods to reduce emissions of unburned hydrocarbons, carbon monoxide, nitrogen oxides, smokes, and odors from jet aircraft are examined. Reductions in smoke levels from commercial engines were effected through leaner primary zones. In experimental combustors, smoke emissions were reduced through improved mixing of air and fuel and increased primary-zone airflow. Emissions of hydrocarbons and CO increased with decreasing combustor-inlet temperature and pressure and increasing combustor reference velocity. Emissions of NOx increased with increasing combustor-inlet temperature and pressure and decreasing reference velocity. Hydrocarbon and CO emissions were significantly reduced by improving fuel atomization through the use of air-assist fuel nozzles. (Author summary modified)

29312 **APTIC NO. 51615**

Campbell, Ivor E. and James E. Foard

SULFUR OXIDE CONTROL AT THE COPPER SMELTER. ***Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:639-652. (Nov. 8-12.)***

The state-of-the-art of sulfur dioxide control with particular application to copper smelters is reviewed with respect to smelter operation, emission sources, and pilot plant studies. The various control methods include wet lime, sodium sulfite, and limestone scrubbing processes, sodium sulfite absorption desorption, ammonia scrubbing, sodium citrate absorption, sulfur reduction through reaction of SO2 with reformed natural gas, and SO2 absorption in fly ash, slags, and other waste materials.

29313 **APTIC NO. 51613**

Craig, John M., Burke Bell, and J. M. Fayadh

MOBILE PILOT PLANT STUDY OF THE WET LIMESTONE PROCESS FOR SO2 CONTROL. ***Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:575-602. (Nov. 8-12.)***

A mobile pilot plant was constructed and installed at two electric generating plants, one oil-fired and the other coal-fired, to study the nature and operating variables of wet limestone scrubbing for sulfur dioxide control. The design and operation of the plant and the special scrubber were studied with respect to corrosion of the metal components, scale formation, operating problems, gas contents of sulfur oxides, nitrogen oxides, and particulates, gas flow rate and temperature, and slurry composition and characteristics. In the pilot plant tests, SO2 removal efficiency of the process was within 69.6-84.2%.

29314 **APTIC NO. 51611**

Drehmel, Dennis C.

LIMESTONE TYPES FOR FLUE GAS SCRUBBING. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. I:167-194. 6 refs. (Nov. 8-12.)*

Different types of limestone were tested and compared with respect to their dissolution rates in acid media and their sulfur oxide removal efficiencies in a batch scrubber. The most effective carbonate rock types for flue gas scrubbing were Michigan marl and Kansas chalk, whether in calcined or uncalcined forms. The dissolution rates were a strong function of pH and were most rapid at low pH. Dissolution doubled at 70-110 F. For calcined carbonate rocks, the change in scrubbing efficiency with calcination temperature was a function of the change in surface area or pore volume. At higher calcination temperatures, reactivity was decreased. (Author conclusions modified)

29315 **APTIC NO. 51616**

Elder, H. W.

PROTOTYPE AND FULL SCALE TESTS. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:653-656. (Nov. 8-12.)*

Ideas discussed at a session on prototype and full-scale applications of the lime/limestone wet scrubbing process for sulfur dioxide control are summarized. Topics ranged from plans for full-scale installations to availability of raw materials. The main theme was the concern over the reliability of the scrubber system as compared with the power plant. The problem of waste disposal and economics were also examined.

29316 **APTIC NO. 51619**

Epstein, M., F. Princiotta, R. M. Sherwin, L. Szeibert, and I. A. Raben

TEST PROGRAM FOR THE EPA ALKALI SCRUBBING TEST FACILITY AT THE SHAWNEE POWER PLANT. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:693- 743. 6 refs. (Nov. 8-12.)*

The test program implemented to evaluate the feasibility and economics of the closed-loop limestone wet-scrubbing process is examined. The program was designed to investigate the operating and design problems, characterize scrubber and system performance as a function of process variables, study solid waste disposal methods, develop mathematical models for economic scale-up, determine optimum operating conditions for maximum SO2 and particulate removal, and test for long-term reliability. The major operating variables include scrubber configuration, air flow rate, liquor flow, limestone type and particle size, excess air value, and additive composition.

29317 **APTIC NO. 51623**

Fabuss, Bela M.

CALCIUM SULFATE SCALING. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:965-974. (Nov. 8-12.)*

The scaling problem involved in the lime scrubbing of stack gases is reviewed with respect to the mechanism of scaling, effects of operating variables, and the basic kinetics. Scaling occurs only at high conversions at low pH values; it is the result of a sequence of processes, involving the dissolution of calcium sulfite, oxidation in the dissolved state, and precipitation of calcium sulfate with potential further conversion to anhydrite scale. Scale-free operation can be achieved by proper selection of the operating variables affecting the equilibria and kinetics of the process. (Author summary modified)

29318 **APTIC NO. 51639**

Gifford, D. C.

WILL COUNTY UNIT 1 LIMESTONE WET SCRUBBER. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubber Symp., 2nd, New Orleans, La., 1971, vol. II:917-929. (Nov. 8-12.)*

The design, operations, and economics of a full-scale limestone wet scrubbing system implemented at a power plant are examined. The system was designed to remove 98-99% of the particulate matter and 76-83% of the sulfur dioxide from boiler flue gases with a venturi scrubber and electrostatic precipitator. The process steps, equipment design, and operating variables are examined. The estimated investment costs for the system, including equipment, installation, and professional engineering charges, were over $8 million, with operating costs estimated at $0.26/MBtu.

29319 **APTIC NO. 51632**

Hausberg, Gerhard

THE BISCHOFF PROCESS -- INITIAL RESULTS FROM A FULL-SIZE EXPERIMENTAL PLANT. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:785-798. (Nov. 8-12.)*

The design and operation of the Bischoff process for the control of sulfur dioxide emissions from power plants were examined based on operating experiences at a full-scale pilot plant. The process involves a scrubber unit with lime added for SO2 removal and an electrostatic precipitator for dust removal. The effects of the lime-SO2 ratio, flue gas flow rate, dust content, gas volume, and scrubber design on SO2 removal efficiency and scrubber operation were studied. Solid waste disposal methods and possible uses for the waste sludge were also reviewed.

29320 **APTIC NO. 51637**

James, J. W.

ONTARIO HYDRO S PROTOTYPE LIMESTONE SCRUBBER FOR SO2 REMOVAL FROM CLEAN FLUE GAS. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:899-905. (Nov. 8-12.)*

The design and operating variables of a prototype limestone wet scrubber system for the removal of sulfur dioxide from clean flue gas with application to coal-fired boilers are reviewed. A spray tower scrubber was chosen for a pilot plant because of its fairly high reliability and ease of operation. The SO2 removal efficiency was a minimum of 70% at a value of 1.3 stochiometric for limestone consumption. High efficiency electrostatic precipitators or venturi scrubbers were used for particulate control.

29321 **APTIC NO. 51617**

Jonakin, James and James Martin

APPLICATIONS OF THE C-E AIR POLLUTION CONTROL SYSTEMS. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:657-672. (Nov. 8-12.)*

The design, application, costs, and operating variables of two wet-scrubbing processes for the control of sulfur dioxide from power plant boilers are examined. The furnace injection process involves injecting and alkaline additive, e.g., limestone, into the furnace of a steam generating unit. The additive is calcined for greater reactivity in the dry state: about

20-30% of the sulfur oxides, including all the sulfur trioxide, is removed in this phase. The flue gas containing the unreacted SO2 and the calcined additive flows to the wet scrubber where the additive reacts with the SO2 and water and fly ash is removed. The tail-end process uses pulverized limestone or slaked lime to scrub the flue gases, with removal efficiencies of 80% or more for the SO2 and 99% and greater for particulate matter.

29322 **APTIC NO. 51625**

Martin, J. R.

DEPOSITION PROBLEMS AND SOLUTIONS IN THE COMBUSTION ENGINEERING LIME/LIMESTONE WET SCRUBBING SYSTEMS. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:983-999. (Nov. 8-12.)*

The problem of scaling involved in the lime/limestone wet scrubbing processes for the control of sulfur dioxide is reviewed with respect to the mechanisms of scale formation and variables affecting scaling and scale control. Scale formation due to mechanical deposition and chemical scale were examined. The major variables included supersaturation of calcium sulfate, pH value, and scrubber design. Practical solutions implemented as scale controls are reviewed.

29323 **APTIC NO. 51621**

McKenna, J. D. and R. S. Atkins

THE RC/BAHCO SYSTEM FOR REMOVAL OF SULFUR OXIDES AND FLY ASH FROM FLUE GASES. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:765-784. 3 refs. (Nov. 8-12.)*

The design and operating variables of a sulfur oxides and fly ash removal system for boiler flue gases were studied to evaluate the techno-economic and market potentials of the system. The system uses a two-stage lime slurry wet scrubbing process to achieve a sulfur dioxide removal efficiency of 96.2-97.5%. The annual operating costs of a 40-megawatt system were estimated at $315,900, not including solid waste disposal.

29324 **APTIC NO. 51618**

McKinney, B. G. and A. F. Little

REMOVAL OF SULFUR DIOXIDE FROM STACK GASES BY SCRUBBING WITH LIMESTONE SLURRY: DESIGN CONSIDERATIONS FOR DEMONSTRATION FULL-SCALE SYSTEM AT TVA. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La. 1971, vol. II:673-691. (Nov. 8-12.)*

The design and operation of the limestone slurry scrubbing system for the control of sulfur dioxide were examined to optimize the process for installation at a TVA power plant. The major design factors included limestone handling and grinding; scrubber design with respect to gas velocity, entrainment separation, liquor flow rate, limestone amount, and particle size; particulate removal; equipment arrangement; flue gas handling and conditioning; instrumentation and control; construction materials; and solid waste disposal methods. (Author abstract modified)

29325 **APTIC NO. 51638**

McPhee, D. T.

LA CYGNE STATION AIR QUALITY SYSTEM. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:907-913. (Nov. 8-12.)*

Emission controls implemented at a coal-fired electric generating station are reviewed with respect to design, operation, and costs. A venturi scrubber was installed for particulate removal and a limestone absorption process was chosen for sulfur dioxide removal from flue gases. Removal efficiencies were set at 99% for particulate matter and 80% for SO2. The total cost of the emission control system was estimated at $32.5 million.

29326 **APTIC NO. 51634**

Mundth, Lyman K.

WET SCRUBBER INSTALLATIONS AT ARIZONA PUBLIC SERVICE COMPANY POWER PLANTS. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:851-861. (Nov. 8-12.)*

The design and operating procedures of wet scrubber installations at two coal-fired power plants are examined. Both plants are equipped with a venturi scrubber system for particulate removal and an absorber tower with an alkaline additive for sulfur dioxide control. Waste disposal methods, controls, and equipment layout are considered.

29327 **APTIC NO. 51636**

Noer, J. A. and A. E. Swanson

AIR POLLUTION CONTROL AT THE NORTHERN STATES POWER COMPANY SHERBURNE COUNTY GENERATING PLANT. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:877-897. 2 refs. (Nov. 8-12.)*

The design, operation, economics, and emission controls of a low-sulfur coal-fired electric generating plant are reviewed. Capital expenditures are estimated at $360 million, including $25.5 million for the air pollution control system. Each steam generator will be equipped with a tail-end limestone spray tower wet scrubber with a removal efficiency of 99% for particulate matter and 50% for sulfur dioxide. Solid waste and effluent disposal methods are discussed.

29328 **APTIC NO. 51635**

Padron, Robert R. and Kenneth C. O Brien

A FULL SCALE LIMESTONE WET SCRUBBING SYSTEM FOR THE UTILITY BOARD OF THE CITY OF KEY WEST, FLORIDA. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:865-875. (Nov. 8-12.)*

The economics, proposed operation, and possible operating problems of a full scale limestone wet scrubbing process proposed for installation in a power plant are reviewed. Some of the factors considered in choosing the control process included an efficiency of 85% removal for sulfur dioxide and 95% removal of all particulate matter, operating ease and flexibility, availability of required materials, the corrosion-potential of construction material, and solid waste disposal methods.

29329 **APTIC NO. 51614**

Phillips, Robert J.

SULFUR DIOXIDE EMISSION CONTROL FOR INDUSTRIAL POWER PLANTS. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:603-638. (Nov. 8-12.)*

Sulfur dioxide emission control processes were tested for application in industrial power plants. The efficiencies and economic feasibilities of the dry additive injection system, wet scrubbing with lime, soda ash scrubbing, and caustic soda scrubbing with lime regeneration were studied. A pilot plant was constructed to test the lime regeneration system. The plant design and operation, testing and operating variables, scrubber design and performance, and economics were examined. The caustic-lime regeneration system using sodium hydroxide was determined practical, with efficiencies in excess of 90% with standard low energy scrubbing equipment. Particulate emissions were also substantially reduced.

29330 **APTIC NO. 51627**

Schwitzgebel, Klaus

DEVELOPMENT AND FIELD VERIFICATION OF SAMPLING AND ANALYTICAL METHODS FOR SHAWNEE. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:1017- 1052. (Nov. 8-12.)*

The sampling and analytical techniques developed to test the efficiency of lime/limestone based wet scrubbing sulfur dioxide removal processes were examined. Problem areas, including sampling, sample handling, and analysis, were studied. The various techniques including gravimetric methods, direct and indirect titrimetric procedures, colorimetry, turbidimetry, atomic absorption spectrophotometry, iodimetric methods, potentiometric methods, spectrophotometry, X-ray fluorescence, and X-ray diffraction, were tested with respect to operating variables, applicability, sensitivity, instrumentation, and experimental procedure. These methods are used to monitor the liquid scrubbing solution, solids collected on a filter, and cleaned stack gas.

29331 **APTIC NO. 51612**

Shapiro, J. L. and W. L. Kuo

THE MOHAVE/NAVAJO PILOT FACILITY FOR SULFUR DIOXIDE REMOVAL. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. I:507-526. (Nov. 8-12.)*

A research project was initiated to test the alkali absorption process for the removal of sulfur dioxide on a pilot plant basis. The specific characteristics of the process was studied with application to boilers fired with low-sulfur fuel. The design and operation of the plant, monitoring system, and analysis procedures are reviewed. Three absorbents (limestone, lime, and soda ash) were tested in four types of absorbers scrubbers, at parametric variations of gas flow rate, liquid-gas ratio, and pH, and efficiency with respect to SO2 absorption efficiency, nitrogen oxide, trace metals, sulfur trioxide, and fluorine, concentrations, and particulate removal efficiency.

29332 **APTIC NO. 51622**

Slack, A. V. and J. D. Hatfield

REMOVAL OF SULFUR DIOXIDE FROM STACK GASES BY SCRUBBING WITH LIMESTONE SLURRY: OPERATIONAL ASPECTS OF THE SCALING PROBLEM. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubber Symp., 2nd, New Orleans, La., 1971, vol. II:947-963. 7 refs. (Nov. 8-12.)*

The operational aspects of the scaling problem in lime/limestone scrubbing for the removal of sulfur dioxide from flue gases were studied. The effects on the scaling mechanism of various process variables, including the degree of desupersaturation in the surge tank, amount of SO2 absorbed per unit of liquor recirculated, the relative merits of lime or limestone, presence of fly ash, degree of oxidation, and scrubber design, were examined. The most effective measures to avoid scaling were adequate delay time for desupersaturation, use of limestone rather than lime, high recirculation rate, elimination of surfaces that collect solid particles, high solids content in the slurry, and the use of scrubbers designed to maximize the scouring action. (Author abstract modified)

29333 **APTIC NO. 51641**

Slack, A. V.

PROBLEMS RELATED TO SCALING IN LIME/LIMESTONE WET SCRUBBING. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubber Symp., 2nd, New Orleans, La., 1971, vol. II:943-945. (Nov. 8-12.)*

Problems related to scaling in lime/limestone wet scrubbing systems for the removal of sulfur dioxide from waste gases are summarized. The design and operating factors involved in scrubber scaling include the amount of SO2 absorbed per unit of slurry passed through the scrubber; content of calcium sulfate and calcium sulfite crystals in the recirculated slurry; degree of supersaturation outside the scrubber before the return of the slurry; pH levels at various points in the circuit; scrubber design as related to solids settling out of the slurry and the scouring effect of the slurry; degree of oxidation in the scrubber; and point of lime introduction into the circuit.

29334 **APTIC NO. 51633**

Uno, Tsukumo, Masumi Atsukawa, and Kenzo Muramatsu

THE PILOT SCALE R AND D AND PROTOTYPE PLANT OF MHI LIME-GYPSUM PROCESS. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:833-849. (Nov. 8-12.)*

The design, operating variables, operation of the pilot plant, and technical feasibility of the lime-gypsum process for sulfur dioxide removal from the flue gases of power plants are examined. The process involves scrubbing the flue gas with a lime slurry to remove SO2 and subsequent recovery of gypsum as a by-product through air oxidation of the calcium sulfite formed in the absorber. The major chemical reactions, spray tower design and operation, and techniques for the prevention of scaling are reviewed.

29335 **APTIC NO. 51640**

Willett, H. P. and I. S. Shah

A SUMMARY REPORT -- CHEMICO S COMMERCIAL SYSTEMS INSTALLATIONS AT ELECTRIC POWER GENERATING STATIONS. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubber Symp., 2nd, New Orleans, La., 1971, vol. II:931-942. (Nov. 8-12.)*

Emission control systems implemented at coal- and oil-fired electric generating plants are reviewed with respect to process design and operation. The technologies of mechanical collectors, electrostatic precipitators, and scrubber systems for particulate (fly ash) removal from boiler flue gases and a magnesium oxide absorber-venturi scrubber system with by-product recovery and a lime wet scrubber system for sulfur dioxide removal are examined.

1970

29336 **APTIC NO. 51475**

Auclair, Mascarello

THE REMOVAL OF SULFUR FROM FLUE GASES FROM THE COMBUSTION OF FUEL OILS IN LARGE THERMAL-ELECTRIC POWER PLANTS. *(Odsiarczanie spalin pochodzacych ze spalania olejow opalowych w duzych elektrocieplowniach). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(5):12-21, 1970. (Presented at the French-Polish Symposium on Air Pollution Control, Paris, France, Nov. 17-21, 1969.)*

NTIS: TT 70-P55124/5

The process design, operation, and costs of a control method for the removal of sulfur from the flue gases of large fuel oil fired electric power plants are examined. The flue gases containing sulfur dioxide and sulfur trioxide are primarily treated with gaseous ammonia to form sulfur-ammonium compounds, (93-97% efficiency) which are further purified by mechanical impact and washing in a primary and secondary scrubber. Ammonia is recovered by adding milk of lime to the scrubber solution. Sulfur dioxide may be recovered as a by-product, depending on the economic feasibility.

29337 **APTIC NO. 51294**

Kozmin, Yu. A., E. V. Davydov, E. A. Davydova, A. E. Porkhunov, and V. I. Polulyakh

PILOT TESTS ON AN ALKALINE-ELECTROLYTIC METHOD OF TREATING LEAD DUSTS. *Soviet J. Non-Ferrous Metals (English translation from Russian of: Tsvetn. Metal.), 11(9):49-51, Sept. 1970. 4 refs.*

A method was developed for treating dusts emitted from the lead manufacturing industry based on an electroleaching technique. A pilot unit was constructed to test the alkaline-electrolytic method, and the design, operation, and application of the method are reviewed. Dust composition was mainly lead, zinc, cadmium, selenium, arsenic, and sulfur. The method recovers selenium and arsenic from converter and agglomeration dusts by caustic soda solutions with simultaneous electrolytic precipitation of selenium on the cathode.

29338 **APTIC NO. 51053**

Sands, Stephen C.

ENVIRONMENTAL DESIGN GUIDE FOR POST OFFICE EQUIPMENT. *Texas Agricultural and Mechanical Univ., College Station, Thesis (M.S.), May 1970, 99p. 25 refs.*

NTIS, DDC: AD 739156

This report specified the acceptable environmental ranges that should exist in U. S. post offices. It is necessary that post office equipment conform to these environmental specifications in order to maintain a safe and comfortable work environment for post office employees. If these environmental specifications are maintained in post offices, then personnel and equipment are better able to perform at maximum levels of efficiency. The environmental parameters specified are temperature, humidity, air velocity, illumination, noise, vibrations, air contamination (primarily dust), and environmental safety. Some methods to measure these parameters and methods to reduce or eliminate problems associated with these parameters are included. (Author abstract modified)

196E

29339 **APTIC NO. 51643**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

RESTRICTING EMISSION OF HYDROGEN SULPHIDE AND OTHER SULPHUR- CONTAINING COMPOUNDS, EXCEPT SULPHUR DIOXIDE, FROM GAS GENERATORS IN COKE, GAS, AND COAL-CONSTITUENT PROCESSING PLANTS. *(Gasauswurfbegrenzung Schwefelwasserstoff und andere schwefelhaltige Verbindungen ausser Schwefeldioxyd Kokereien und Gaswerke, Kohlenwertstoffbetriebe). VDI (Ver. Deut. Ingr.) Richtlinien, No. 2109, APTD-1479, May 1960. Translated from German. 22p.*

NTIS: PB 221191-T

Verein Deutcher Ingenieure specifications on air pollution are presented. They are divided into the following groups: Permissible emission on concentration; calculation of the distribution of dust and gas; restriction of the emission of dust and gas; and dust and gas measuring techniques. The inner relationship of these four groups is considered. In coking, coke oven gas, and coal processing plants, dust, mist, and gas are emitted during several production stages. The present VDI specifications concern the emission of hydrogen sulfide and other sulfur compounds. Measures for the reduction of emission and guidelines for the restriction of emission are described.

MEASUREMENT METHODS

1973

29340 **APTIC NO. 51652**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection and Tokyo Metropolitan Environmental Protection Research Inst.

THREE-POINT COMPARISON SYSTEM, SMELL BAG METHOD, AND ODOR CONTROL TECHNIQUES (PREVENTIVE AND DEODORIZING METHODS). *(Santen hikakakushiki shutaiho. Boshigijutsu (Bo, dasshu hoho)). Text in Japanese. 28p , May 1973.*

A new three-point smell bag method was used to measure odors by combining the panel measurement method with a statistical method. The panel tests the sample in a mylar bag. The sample is diluted to the prescribed density. Two bags are filled with clean air and used for comparison. Correct answers give 1.0 points, incorrect answers give 0, and unclear answers give 0.33. The results are analyzed by a statistical method. Odor control methods are discussed including combustion (afterburning), contact oxidation, adsorption, oxidation, chemical treatment, masking, corona discharge electrode method, and neutralization.

29341 **APTIC NO. 51702**

Ahmed, Samir A.

MOLECULAR AIR POLLUTION MONITORING BY DYE LASER MEASUREMENT OF DIFFERENTIAL ABSORPTION OF ATMOSPHERIC ELASTIC BACKSCATTER. *Appl. Opt., 12(4):901-903, April 1973. 7 refs.*

Molecular air pollution monitoring by dye laser measurement of differential absorption of atmospheric elastic backscatter is discussed. The uses of lasers for atmospheric pollution monitoring are reviewed, including the use of Raman backscatter, resonance fluorescence backscatter, and long path resonance absorption. The use of dye lasers is described, and several features of this method are listed. The basic radar equation that applies to this system is given, and the power requirements for this type of monitoring system are discussed. The method is also applicable to measurements in the infrared range, but would require infrared lasers or parametric converters.

29342 **APTIC NO. 51033**

Baldeck, Charles and G. William Kalb

THE DETERMINATION OF MERCURY IN STACK GASES OF HIGH SO2 CONTENT BY THE GOLD AMALGAMATION TECHNIQUE. *TraDet, Inc., Columbus, Ohio, Environmental Protection Agency Office of Research and Monitoring Contract 68-02-0697, Program Element 1H1326, EPA-R2-73-153, 119p., Jan. 1973. 14 refs.*

NTIS: PB 220323

A procedure was developed which allows a sampling time of at least 15 min at isokintic rates to obtain and show a collection efficiency of at least 95% for the mercury and to perfect the method of firing the gold into an acidic potassium manganate solution with subsequent analysis of aliquots of this solution by flameless atomic absorption. The gold amalgamation technique avoids interferences by strongly reducing substances, such as sulfur dioxide, encountered in the direct application of the normally used wet oxidation techniques to these sources. Sources of error and possible gold contamination are discussed. Analytical procedures for determining the mercury concentration were studied. The recommended procedure for the determination of mercury in a stack gas using the method optimized is presented. All the objectives were successfully attained in this study.

29343 **APTIC NO. 51234**

Barth, Charles A., David W. Rusch, and A. Ian Stewart

THE UV NITRIC-OXIDE EXPERIMENT FOR ATMOSPHERE EXPLORER. *Radio Sci., 8(4):379-385, April 1973. 22 refs.*

The ultraviolet nitric oxide (UVNO) experiment for Atmospheric Explorer is explained. It is a two-channel, fixed-grating spectrometer which is to measure the airglow in the (1,0) gamma band at 2150 Angstrom. The observed intensity is produced by resonance fluorescence of sunlight by the nitric oxide molecules in the instrument s field of view, and the intensity profiles obtained will be inverted to yield altitude profiles of nitric oxide density. The density profiles will be obtained as functions of time and geographic location. Results can be used in investigations of the sources, sinks, and transport of nitric oxide and, in cooperation with other Atmospheric Explorer experiments, in investigations of thermospheric ion chemistry, the morphology of the turbopause, and auroral perturbations of the thermosphere. (Author abstract)

29344 **APTIC NO. 51361**

Beck, R. and W. Englisch

MEASUREMENTS OF AIR POLLUTANT EMISSIONS BY MEANS OF LASERS. *(Emissions- und Immissionsmessungen von Luftverunreinigungen mittels Laser). Text in German. Messtech., 81(2):39-45, Feb. 1973.*

The use of lasers for in situ or remote measurements of air pollutant emissions is described. Fast and accurate analysis even of very low pollutant concentrations in single samples or in continuously admitted streams is possible with lasers. The lower limits of detection by in situ measurement for sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, and hexane are 0.12 mg/N cu m, 0.016 mg/N cu m, 0.034 mg/N cu m, 0.94 ppm, and 0.19 ppm, respectively, which is considerably lower than those specified by VDI standards. Remote analysis is possible by Raman scattering, resonance fluorescence, and resonance absorption measurements. Exploiting the Raman effect requires monochromatic pulses with high-power peaks and sensitive receiver systems, while resonance absorption measurement necessitates no extremely high power, but well-defined wavelengths, which is possible both in the visible and the UV and IR spectral ranges. Fluorescence measurements require a high-power laser with a well-defined absorption line for the selective excitation of a given type of molecules. Losses due to absorption are absent in laser technique, but losses due to elastic scattering (Rayleigh and Mie scattering), the magnitude of which is primarily a function of the applied wavelength, are unavoidable.

29345 **APTIC NO. 51146**

Beyermann, K. and W. Eckrich

GAS CHROMATOGRAPHIC DETERMINATION OF TRACES OF INSECTICIDES IN AIR. *(Gas-chromatographische Bestmmung von Insecticid-Spuren in Luft). Text in German. Z. Anal. Chem., 265(1):4-7, 1973. 4 refs.*

The collection of pesticides from air samples is possible by adsorption on polyethylene glycol layers that are spread on stainless steel nets. The adsorbed pesticides are dissolved in benzene and determined by gas chromatography. Typical concentrations found in some air samples are about 150 ng aldrine/cu m, 300 ng DDT/cu m, and a few micrograms of Daconil/cu m. About 50% of the insecticide concentration is retained in the respiratory system as demonstrated by the analyses of the inspired and expired air.

29346 **APTIC NO. 51711**

Butler, Paul and Lynton McLain

INSTRUMENTS AND PROCESS TECHNOLOGY FACE UP TO THE CHALLENGE FROM NOX. *Process Eng., p. 84-86, 89, 91, April 1973. 3 refs.*

The newest instruments and abatement technology used to measure and control nitrogen oxides emissions are reviewed. Nitrogen oxides emission sources are listed, including: power station stack gases, automobiles, stationary internal combustion engines (gas turbines and diesel engines), and chemical processing plants. Various measurement methods are discussed, including the Jacobs-Hochheiser method, chemiluminescence, and photometry. Instruments developed for measurements of nitrogen oxides are described. The limitations of the developing control technology are considered, including absorption, catalytic treatment, fuel substitution, air/fuel ratio change, and catalytic reduction.

29347 **APTIC NO. 51220**

Chan, Shih H., Chuen C. Lin, and M. J. D. Low

ANALYSIS OF PRINCIPLES OF REMOTE SENSING AND CHARACTERIZATION OF STACK GASES BY INFRARED SPECTROSCOPY. *Environ. Sci. Technol., 7(5):424-427, May 1973. 19 refs.*

The remote sensing of stack gases by infrared emission spectrometry was studied analytically. A mathematical expression was derived which related the concentration of gaseous pollutants to the infrared band parameters and the mean temperature of the stack gases. The band parameters used were independent of the resolution of spectrometers used in remote sensing or in laboratory measurements undertaken to define the spectral characteristics of the gases. Data obtained under various conditions of resolution can be applied directly to remote sensing. A method was proposed by which the temperature of the stack gases can be estimated from the spread of the peak of the P or R branch of a vibration-rotation band of the remotely observed emission spectrum. The application of these principles to the remote sensing of sulfur dioxide by measuring the v1 SO2 emission band was considered. (Author abstract)

29348 **APTIC NO. 51537**

Cohen, Arnold L.

DEPENDENCE OF HI-VOL MEASUREMENTS OF AIRFLOW RATE. *Environ. Sci. Technol., 7(1):60-61, Jan. 1973. 9 refs.*

The dependence of high-velocity measurements on airflow rates is discussed. Comparisons of particulate concentration data obtained from high-volume air pollution samplers are given. A difference on only 1% was found between hi-vol samplers operated at 50 and 60 cfm, and hi-vols operated at 40 and 60 cfm exhibited a 3.9% difference. Loss of submicron aerosol particles through the filter pores at the higher face velocities account for the discrepancies. The reported data indicate the necessity to control the conditions under which air samples are collected in the various localities. (Author abstract)

29349 **APTIC NO. 51284**

Dailey, William V.

MONITORING TOXIC AND FLAMMABLE HAZARDS. *Instrum. Technol., 20(2):23-28, Feb. 1973. 7 refs. (Presented at the Instrument Society of America Conference, 27th Annual, New York, 1972.)*

A general survey of techniques and instruments to monitor the dangers of explosion, fire, and health hazards to operating personnel is presented. Some guidelines on systems applications are included. Detection is affected by ventilation patterns, leak locations, characteristics of various gases, and other factors peculiar to the installation or process. Sampling system design and readout and alarms are used. Maintenance and installation of monitoring equipment are described. Hazardous gas analyzers discussed include non-dispersive infrared analysis, chemical analysis, optical methods, ionization detection, colorimetry, and electrochemical methods.

29350 **APTIC NO. 51550**

Dvoryaninova, N. K., A. G. Bondareva, and A. I. Chepkasov.

COMPARATIVE ASSESSMENT OF SOME METHODS FOR THE DETERMINATION OF ALPHA-METHYLSTYRENE IN THE AIR. *(Sravnitelnaya otsenka nekotorykh metodov opredeleniya alfametilstirola v vozdukhe). Text in Russian. Gigiena i Sanit., no. 4:62-65, 1973. 5 refs.*

Nephelometric, spectrophotometric, chromatographic, and kinetic- spectrophotometric methods for the determination of alpha methylstyrene in the air of rubber manufacturing plants are compared. Chromatographic and kinetic-spectrophotometric methods proved to be most suitable for the determination of alpha-methylstyrene, and to be specific for this compounds even in the presence in the air of alkylbenzenes, unsaturated hydrocarbons, and pyridine bases. The chromatographic method requires increased sample volume. The nephelometric and spectrometric methods are not suitable for the detection and determination of alpha-methylstyrene present in concentrations near the maximum allowable level.

29351 **APTIC NO. 51557**

Elinson, M. M., L. A. Nosova, and I. M. Ovchinnikov

METHOD AND APPARATUS FOR THE DETERMINATION OF SMALL CONCENTRATIONS OF ACID GASES. *(Metodika i apparatura dlya opredeleniya malykh kolichestv kislykh gazov). Text in Russian. Zavodsk. Lab. (Moscow), no. 3:272-274, 1973. 2 refs.*

A method and apparatus for the determination of carbon dioxide, hydrogen sulfide, sulfur dioxide, and chlorine in the presence of oxygen, nitrogen, hydrogen, carbon monoxide, by colorimetry and methane is described. The apparatus, representing a modified version of the Elinson apparatus for the determination of gases hydrocarbons in natural gas, contains condensation tubes cooled by fluid nitrogen for the retention of the acid gases and for the removal of H2, CO, N2, O2, and methane. Following global determination of all condensed gases, the latter are consecutively passed through tubes containing selective adsorbing powders by means of carrier gas, while the condensed gases are heated to room temperature in a first tube, and cooled by fluid nitrogen in another. The solid adsorbents used are zinc acetate-soaked marble powder with barium chloride for H2S, zinc acetate-soaked marble powder with sodium nitroprusside and urotropine for SO2, potassium boride and sodium carbonate soaked silicagel with fluoresceine for Cl2, and a material containing strontium chloride, hydrazine sulfate, fuchsine and hydrazine hydrate for CO2. The high-efficiency adsorbents for CO2, H2S, and SO2 can be used for 25 to 30 consecutive analyses, while partial adsorption of CO2 by the Cl2-specific adsorbent occurs.

29352 **APTIC NO. 51596**

Finkelson, Martin J.

GAS-SOLID CHROMATOGRAPHIC DETERMINATION OF OXYGEN, NITROGEN, CARBON DIOXIDE, ETHYLENE, AND NITROUS OXIDE AT AMBIENT TEMPERATURE. *J. Assoc. Offic. Anal. Chemists, 56(1):119-123, Jan. 1973. 11 refs. (Presented at the Association of Official Analytical Chemists, Annual Meeting, 86th, Washington, D. C., Oct. 9-12, 1972.)*

A gas-solid chromatographic method was developed for the determination of oxygen, nitrogen, carbon dioxide, ethylene, and nitrous oxide in the atmosphere at ambient temperatures. The instrumentation includes two gas chromatographic columns operated in series with a six-port thermal conductivity detector and a recorder. An electronic digital integrator is used for calculating peak areas. The apparatus and analytical procedure were examined with respect to retention time, linearity, reproducibility of results, and comparison with absorption methods. (Author abstract modified)

29353 **APTIC NO. 51172**

Grubner, Otto and Abraham S. Goldin

SENSITIVE GAS CHROMATOGRAPHIC DETECTION OF NITROGEN DIOXIDE. *Anal. Chem., 45(6):944-947, May 1973. 8 refs.*

A procedure for the analysis of nitrogen dioxide by gas chromatography, based on the reaction of NO2 with styrene, was developed. The reaction products are separated by gas chromatography and detected by electron capture or flame ionization detectors. The effects of various operating factors, including concentration, time of reaction, and interferences of water, ozone, nitric oxide, chlorine, and sulfur dioxide are examined. Detection limits are such that 2 nm of NO2 in a gas sample can be detected. (Author abstract modified)

29354 **APTIC NO. 51120**

Grupinski, Leonhard and Winfried Staub

DETERMINATION OF EMITTED CRESOL FROM WIRE LACQUERING STATIONS BY INFRARED SPECTROMETRY. *(Bestimmung von emittiertem Kresol aus Drahtlackieranlagen mit Infrarotspektrometrie). Text in German. Staub, Reinhaltung Luft, 33(5):199-202, May 1973. 5 refs.*

Catalytic burning is highly suitable for cleaning waste gases from wire lacquering machines. In particular the cresol used must have a high degree of purity to make sure that there is no poisoning of the catalytic mass. Infrared spectrometry can be used to measure cresol in waste gases. The sampling time is 15-30 min. The relative detection limit of 2 mg cresol/cu m of waste gas is reached by using cells with a layer 10 mm thick. Cells with quartz or silicon windows are particularly suitable, since no care must be taken to protect them against water, which is necessary in the case of sodium chloride windows. For wire lacquering stations, catalysts in the form of wire meshes or a honeycomb pattern to which the catalytically active component is applied are used because of the low flow resistance. In most cases a two-stage catalytic afterburning is required for removal of all cresol. For the measurement of the cresol concentration in air, the waste air sample is drawn through a gas scrubber filled with tetrachloride ethylene. Spectrophotometric analysis follows. Interferences with the infrared spectrometric cresol determination may be caused by phenol, alcohols, dioxan, pyridine and amines.

29355 **APTIC NO. 51375**

Guenther, Ulrich

TEN DATA PACKAGES MAKE NO DATA RETRIEVAL SYSTEM YET. *(Zehn Dateien machen noch keine Datenbank). Text in German. Umwelt (Duesseldorf), 3(3):37-42, 1973. 2 refs.*

Emission data are mainly used for the determination of dangerous pollutant concentrations, for determination of future air composition, for evaluation of the efficiency of air quality improvement measures, for alert systems, for checking the accuracy of forecasts, and for studying medical, biological, and ecological relationships. In order to obtain representative data the location and the time must be carefully selected. Measurement grids which are set up for the determination of data must be flexible. They can be divided into primary, secondary, and tertiary grids. Primary grids are set up in residential areas or peripheral to them for monitoring the ground level emission load of the population. Secondary measurement grids serve for monitoring particularly polluted areas. They are set up in industrial areas or peripheral to them. Tertiary measurement grids serve for large-scale air pollution monitoring and for determination of trends, and also, for monitoring relatively clean air. Along with the emission data, meteorological parameters must be measured. The majority of emission data is obtained from operating data. An example of a data retrieval system for emission and their effects is given.

29356 **APTIC NO. 51597**

Harris, E. A.

ACCURATE ANALYSIS OF CARBON DIOXIDE IN OXYGEN-NITROGEN MIXTURES BY INFRA-RED ABSORPTION. *Biomed. Eng. (London), 8(2):66-69, Feb. 1973. 10 refs.*

The design, application, and operating variables of infrared absorption analysis for the determination of carbon dioxide were studied to determine optimum procedures for increased accuracy. Corrections for non-linearity of output and for the dependence of infrared absorption on the oxygen and nitrogen concentrations of the gas samples were examined.

29357 **APTIC NO. 51649**

Hillenbrand, L. J., R. B. Engdahl, and R. E. Barrett

CHEMICAL COMPOSITION OF PARTICULATE AIR POLLUTANTS FROM FOSSIL-FUEL COMBUSTION SOURCES. (FINAL REPORT). *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract EHSD 71-29, EPA-R2-73-216, 158p., March 1, 1973. 19 refs.*

NTIS: PB 219009

The effect of effluent conditions and sampling techniques on the composition and amount of particulates measured in gases emitted from oil and coal-fired combustion sources is discussed. Using an EPA sampling train and single-point sampling procedures, the changes in particulate catch produced by modification of that sampling apparatus and in sample-handling procedures were investigated. The effects of materials of construction, filter-media efficiency, sample drying and handling procedures, and sampling component temperatures on the mass and chemical composition of the collected material were determined. The major problems were associated with alterations in the form of sulfur compounds and the location of their collection in the sampling equipment. The principal conclusions concern the problems of sulfur oxides in the flue gases. Laboratory and field experiments indicate that some common conditions of impinger sample collection and handling can produce a significant increase in the material collected, by oxidation of a minor part of that absorbed sulfur dioxide. Another source of sample alteration is the probe and filter because of the effect of sulfur trioxide in raising the dew point of the gases. The filter should be operated at well above 250 F; the SO3 can then be measured separately by the Shell-Thornton or equivalent method.

29358 **APTIC NO. 51525**

Hirschfeld, Tomas, E. R. Schildkraut, Harvey Tannenbaum, and David Tanenbaum

REMOTE SPECTROSCOPIC ANALYSIS OF PPM-LEVEL AIR POLLUTANTS BY RAMAN SPECTROSCOPY. *Appl. Phys. Letters, 22(1):38-40, Jan. 1973. 8 refs.*

The design and performance of a remote Raman spectrometer are examined. The unit was tested at ranges from several hundred yards to a half-mile under both clear atmosphere and fog conditions. Good S/N ratios were determined for the detection of atmospheric water vapor, carbon dioxide, sulfur dioxide, and hydrocarbon vapors with a range resolution of 10 m. (Author abstract modified)

29359 **APTIC NO. 51708**

Houser, Edwin A.

TECHNIQUE FOR MEASURING STACK EMISSIONS. *Power, 117(4):30-31, April 1973. 2 refs.*

The procedure involved in accurate measuring of sulfur dioxide and nitric oxide in power plant stack gases is reviewed. Both SO2 and NO can be measured by nondispersive infrared analyzers sensitized for high specificity to each constitutent. Interference can be eliminated through optical filtration or, in the case of water vapor interference, by passing the sample through a refrigerated chiller controlled at 35 F. Dry filtration is used to remove any solid or liquid contaminants.

29360 **APTIC NO. 51509**

Inokoshi, Sachio, Masamichi Ikeda, Tatsuo Yamamoto, and Zenji Shinozaki

DETERMINATION OF NITRIC OXIDE BY CHEMILUMINESCENCE. *(Kagaku hakko ni yoru issankachisso no sokutei). Text in Japanese. Tokyo-to- Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 4:108-111, March 1973. 3 refs.*

Since the Saltzman method of measuring nitrogen oxides has several difficulties, a new chemiluminescent measurement method is now being used. During the process, nitric oxide and ozone are reacted to form nitrogen dioxide, and the chemiluminescent intensity is proportional to the NO concentration when there is more O3 than NO. The detection limit of NO is 40 ppb at an ordinary temperature and 3 ppb at -25 C, according to the described experiment. Substances other than NO2 can be ignored. This method has a high sensitivity and reliability, no reagent is needed, and operation and maintenance are easy, however, the vacuum pump may be damaged by O3.

29361 **APTIC NO. 51542**

Iwasaki, K., T. Ishiguro, I. Koyama, Y. Fusushima, A. Kobayashi, and T. Odaira

METHOD OF EVALUATING BAD ODOR POLLUTION (NO. 2) -- TRIANGLE-TYPE METHOD, ODOR BAG SYSTEM. *(Akushu kogai no hyoka hoho no kenkyu (dai 2ho) -- santen hikakushiki nioibukuroho ni tsuite). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 4:78-84, March 1973.*

Odorimetry is a poor odor measurement method due to poor reproducibility and the subjectivity of the testors. Thus, the triangle method was developed. Bad odors were sampled through a bag, and then a panel test was made on a sample with a definite dilution ratio. The relationship between the dilution ratio and the correct answer from the panel testor was examined. One person in three was used, and probability analysis of the results was made. The method produced results close to measured values.

29362 **APTIC NO. 51522**

Izumikawa, Tokuo, Masataka Hayafuku, Kinji Nakano, Kunihiko Asakino, and Toshi Odaira

CONTINUOUS MEASUREMENT AND DETERMINATION OF PAN IN THE AIR. *(Taikichu PAN no renzoku sokutei oyobi teiryo). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 4:41-49, March 1973. 4 refs.*

Ethyl nitrate was photochemically oxidized in an oxygen current to obtain peroxyacetyl nitrate (PAN) which was then refined by gas chromatography after condensation. The PAN was measured with an infrared spectrophotometer to use as a standard gas. Calibration curves were prepared. Atmospheric PAN was measured with gas chromatography using an electron catch detector with special sensitivity to PAN. Optimum analytical conditions were a 40-50 cm column, 30 ml/min of carrier gas, and 20 C temperature of the column. Since the presence of other pollutants is likely to disturb the analysis of PAN, these substances must be carefully separated. Since PAN is very unstable and its concentration in the air is in parts per billion, the operating variables must be carefully chosen.

29363 **APTIC NO. 51032**

Jaye, Fredric C.

MONITORING INSTRUMENTATION FOR THE MEASUREMENT OF SULFUR DIOXIDE IN STATIONARY SOURCE EMISSIONS. *TRW Systems Group, Redondo Beach, Calif., Environmental Protection Agency, Office of Research and Monitoring Contract EHSD 71-23, Proj. 17205, Program Element 1A1010, EPA-R2-73-163, 131p., Feb. 1973. 3 refs.*

NTIS: PB 220202

General operating specifications for sulfur dioxide stack gas monitoring instrumentation are described as a guide for the evaluation and selection of such equipment. The equipment is for continuous monitoring of SO2 in the effluent gases from the combustion process in electric utility power plants using fossil fuels. Adequate monitoring equipment is available to meet Environmental Protection Agency New Stationary Source Performance Standards monitoring requirements as long as the units are dealt with as total systems (such as probe, sample conditioning, and analyzer as an integral unit). Monitoring methods discussed include ultraviolet spectrometry, non-dispersive infrared spectrometry, flame photometric detection mass spectrometry, gas chromatography, conductometry, coulometry, and galvanic or fuel cell detection. Calibration data is given.

29364 **APTIC NO. 51497**

Kawai, Misao

A METHOD OF ANALYZING NITROGEN OXIDES IN EXHAUST GAS. *(Haigasu- chu no chisso sankabutsu bunseiki hoho). Text in Japanese. Kagaku Kojo (Chem. Factory), 17(5):77-87, May 1973.*

The method of analyzing nitrogen oxides contained in exhaust gases from the combustion of fuels, the surface treatment of metals, chemical reaction processes, and automobiles was standardized by JIS-K0104 in 1968 and is used even at the present time. However, as nitrogen oxides are studied as important air pollutants responsible for photochemical smog, and as the measurement of NOx becomes frequent, the problems possessed by the JIS method with regard to the accuracy of measurement and reproducibility become more important. For this reason, the JIS method has been revised. The revised method for total NOx, with exception of nitrous oxide, used the partly revised present method (the phenol-disulfonic acid method) as a standard method. As the analyzing methods for nitric oxide and nitrogen dioxide, a modification of the present Saltzman method, the constant potential electrolytic method, the ozone oxidation heat decomposition method, and the oxygen oxidation ultraviolet absorption method are used. For NO, the infrared gas analyzing method and the chemiluminescence method are recommended.

29365 **APTIC NO. 51490**

Kneebone, Barbara M. and Henry Freiser

DETERMINATION OF NITROGEN OXIDES IN AMBIENT AIR USING A COATED-WIRE NITRATE ION SELECTIVE ELECTRODE. *Anal. Chem., 45(3):449-452, March 1973. 11 refs.*

A new potentiometric method for nitrogen oxide determination was developed using a coated-wire nitrate ion selective electrode. The samples are collected in gas-washing bottles containing peroxide, treated, and then analyzed potentiometrically for nitrate concentration. The optimum conditions for the preparation and use of the electrode were determined. The method can be used in the presence of at least a 40-fold excess of sulfur dioxide or sulfur trioxide. Relative error was 1-4% as compared with accepted spectrophotometric methods. (Author abstract modified)

29366 **APTIC NO. 51283**

Kovalick, Walter W., Jr.

AIR POLLUTION INSTRUMENT MARKETS. *Instrum. Technol., 20(2):29-32, Feb. 1973. 1 ref.*

Air pollution instrumentation is a confused and uncertain market, whose main direction is controlled by government regulations. The seven companies interviewed have sales over $55 million. There are at least 33 companies in the industry. The seven firms are selected to represent gradations in size, complexity of instruments manufactured for gaseous pollutants, and multiplicity of sampling principles. Major descriptive information about each of the companies interviewed is presented.

29367 **APTIC NO. 51552**

Kuchinskiy, A. L.

THE USE OF VEHICLE ENGINE-MOUNTED AIR SAMPLERS. *(Iz opyta ispolzovaniya sanitarnogo transporta dlya vzyatiya prob atmosfernogo vozdukha). Text in Russian. Gigiena i Sanit., no. 4:85-86, 1973.*

A vehicle engine-mounted sampler as used for simultaneous collection of four air samples around the Mogilev synthetic fiber manufacturing plant, is described. The air sampling is secured by the vacuum produced by the engine suction tube. The suction rate is controlled by a rotameter. The absorbers connected to the engine-mounted aspirator are placed at a distance of 25-30 m of the parked car to preclude influence of engine exhaust gases. Two samples at suction rates of 20 l/min and 1 l/min each are taken simultaneously by one car. Sampling is possible at different locations by means of several cars arranged as a function of wind direction.

29368 **APTIC NO. 51360**

Kutzleb, R. E.

ODOTRON: A BETTER WAY TO MEASURE GAS ODORANTS. *Pipe Line Ind., 38(5):56-59, May 1973. 2 refs.*

The design, operation, and application of the ODOTRON, a portable gas chromatograph, to the determination of gas odorants are reviewed. The gas chromatograph responds to those sulfur compounds that contribute to the odor of natural gas and produces an odor profile of the gas. It can measure odorant concentrations from 60 ppb to 8 ppm with an accuracy of + or 10% and is sensitive to various sulfides and mercaptans.

29369 **APTIC NO. 51205**

Leo, R. C., R. S. Thomas, H. Oja, and L. Dubois

APPLICATION OF A GAS CHROMATOGRAPH-MASS SPECTROMETER-DATA PROCESSOR COMBINATION TO THE ANALYSIS OF THE POLYCYCLIC AROMATIC HYDROCARBON CONTENT OF AIRBORNE POLLUTANTS. *Anal. Chem., 45(6):908-915, May 1973. 16 refs.*

A gas chromatograph-mass spectrometer-data processor system was used to determine the polynuclear aromatic hydrocarbon concentration in airborne particulate samples collected by a high-volume sampler. The sampling procedure, instrumentation, and analytical technique are reviewed. More than 70 major polycyclic aromatic hydrocarbons with two to seven rings were separated and identified, including fluorene, phenanthrene, anthracene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, chrysene, benzo(a)pyrene, perylene, picene, phenyls, and triphenylene. Samples of less than 100 micrograms produced good data, with individual components in the nanogram region. (Author abstract modified)

29370 **APTIC NO. 51409**

Lierop, Beryl van

DEVICES AND TECHNIQUES FOR MONITORING STACK EMISSIONS. *Preprint, 8p., March 1973. 9 refs. (Presented at the National Plant Engineering and Maintenance Conference, 24th, Chicago, Ill., March 12-15, 1973, Paper 8.)*

Stack sampling techniques that have been perfected for particulates, sulfur oxides, hydrocarbons, and nitrogen oxides are described. Continuous smoke monitoring and other continuous monitoring devices for emissions either in ambient air or in stacks are also reviewed. The five sampling methods are manual sampling extraction, pump extraction and on-site analysis, in-situ monitoring, remote sensing, and extended or diffused source sampling. These are compared in relation to efficiency and cost. The status of instrument development for the sampling of various gases is presented.

29371 **APTIC NO. 51314**

Melfi, S. H., M. L. Brumfield, and R. W. Storey, Jr.

OBSERVATION OF RAMAN SCATTERING BY SO2 IN A GENERATING PLANT STACK PLUME. *Appl. Phys. Letters, 22(8):402-403, April 15, 1973. 4 refs.*

The observation of Raman scattering by sulfur dioxide in the plume of a 200-MW coal burning electrical generating plant was made at a slant range of 210 m. The laser radar system used consisted of a pulsed ruby laser and a 61 cm in diameter telescope with optical axes alligned parallel. Measurements were performed while the electrical power output of the generating plant was reduced. The one standard deviation bars on the SO2 data are the estimated uncertainty and are equal to the square root of the total counts by assuming Poisson statistics. The SO2 data taken over the time interval 2335-2345 were accumulated for 500 laser firings with a corresponding decrease in one standard deviation bars. This datum point was at 2340 hours and was normalized to an equivalent signal for 100 laser firings. Quantitative measurements of SO2 concentration using laser radar will be possible by comparing SO2 scattering to nitrogen scattering.

29372 **APTIC NO. 51564**

Muthu, Mysore, Suvendu K. Majumder, and Husian A. B. Parpia

DETECTOR FOR PHOSPHINE AT PERMISSIBLE LEVELS IN AIR. *J. Agr. Food Chem., 21(2):184-186, March/April 1973. 14 refs.*

A paper-strip detector was developed for detecting maximum acceptable concentrations of phosphine in the air, i.e., in the range 0.05-0.3 ppm. The strips were prepared by dipping them in a 1% solution of mercuric chloride in methyl yellow. The reaction of phosphine with the mercuric chloride turns the paper red. Strip preparations, testing, field trials, and preliminary results are reviewed.

29373 **APTIC NO. 51586**

Naden, Rex A.

LONG-PATH AVERAGING POLLUTANT SENSORS FOR SOURCE SURVEILLANCE AND AMBIENT MEASUREMENT. *Chemosphere, 2(1):11-18, Jan. 1973. 9 refs.*

The application of air pollution sensors based on the principle of frequency selective absorption of transmitted light by molecular species to source surveillance and ambient pollution measurement was examined. The theoretical bases, numerical calculations, and data analysis are reviewed, with emphasis on the meteorological parameters. Such techniques would include lidar, correlation spectrometry, and resonance absorption analysis.

29374 **APTIC NO. 51176**

Nambisan, P. N. Krishnan and C. G. Ramachandran Nair

MICRODETERMINATION OF CADMIUM: AN IMPROVED TITRIMETRIC PROCEDURE OF THE RULFS-PRZYBYLOWICZ-SKINNER METHOD. *Mikrochim. Acta, no. 2:331-336, March 1973. 13 refs.*

A highly sensitive titrimeteric method was developed for the determination of cadmium, based on a modification of the Rulfs-Przybylowicz-Skinner gravimetric method. Cadmium is precipitated as bis-thiourea cadmium(II) reineckate and the precipitate is then oxidized by chloramine-T, so that 80 equivalents of the oxidant are consumed per mole of cadmium. The chemistry of the technique, instrumentation, and experimental procedure are reviewed. (Author summary modified)

29375 **APTIC NO. 51663**

Ogata, Masana, Hiroka Asahara, Katsumaro Tomokuni, and Takao Saeki

SILICA GEL COLORIMETRY FOR CHLORINATED HYDROCARBONS USED FOR PERSONAL AND ROOM AIR SAMPLERS. *(Yuki enka tanka suiso no kojin oyobi shitsunai sanpura ni mochiirareru shirikageru yori no hasshokuho). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 344-345, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 436.)*

Chlorinated hydrocarbons including 1,1,1-trichloroethane, 1,1,2,2-tetrachloroethane, trichloroethylene, and tetrachloroethylene were sampled using silica gel cooled with dry ice and desorbed using cumene, pyridine, or ethyl ether as a solvent. For the colorimetry using pyridine as the solvent, 6 g of silica gel was added in 40 ml of pyridine, and the mixture was allowed to stand for 1 hr. The pyridine was separated from the silica gel, and 5 ml of pyridine and 2 ml of 10 N potassium hydroxide were added to it. The solution was boiled for 3 min and then cooled with ice for a few minutes. Three ml of the color layer was taken and added to 0.5 ml of 3% benzidine formate. The absorbance was then measured near 535 nm after the solution was allowed to stand at room temperature for 30 min. About 90% of the chlorinated hydrocarbons were recovered by this method.

29376 **APTIC NO. 51370**

Oliver, E.

CONTINUOUS AIR MONITORING SULPHUR DIOXIDE. *Environ. Health, 81(4):65-67, April 1973. 4 refs.*

The most efficient means of air pollution protection is accurate measurement. Accurate measurement of air quality is essential for the detection of pollution sources and to enable further preventive action to be taken. Conductivity, colorimetry, coulometry, and flame photometry principles are used to measure sulfur dioxide. Several commercial direct reading instruments embodying these principles have been produced. Gas chromatographic techniques have been applied successfully in conjunction with the flame photometric detector to assay ambient levels of sulfur dioxide and hydrogen sulfide. The precision of air sampling is influenced by many factors such as atmospheric stability, wind velocity, emission height, and lateral distance of the sampling station with respect to the main sources of emission. Monitoring provides accurate data for calculating trends in long term prediction. A network of high density monitoring stations provides alerting functions which is an active form of public health protection, using actual levels in combination with meteorological forecasting.

29377 **APTIC NO. 51450**

Pinnick, R. G., J. M. Rosen, and D. J. Hofmann

MEASURED LIGHT-SCATTERING PROPERTIES OF INDIVIDUAL AEROSOL PARTICLES COMPARED TO MIE SCATTERING THEORY. *Appl. Opt., 12(1):37-41, Jan. 1973. 15 refs.*

Monodispersed spherical aerosols 0.26-2.0 micron in diameter with approximately the range of indexes of refraction of atmospheric aerosols were produced by the atomization of liquids with a vibrating capillary. Integrated light scattered 8 through 38 deg from the direction of forward scattering was measured with a photoelectric particle counter and compared to the Mie theory calculations for particles with complex indexes of refraction 1.4033-Oi, 1.592-Oi, 1.67-0.26i, and 1.65-0.069i. The agreement was good. The calculations took into account the particle counter white light illumination with color temperature 3300 K, the optical system geometry, and the phototube spectral sensitivity. For aerosol particles of unknown index of refraction, the particle counter size resolution was poor for particle size greater than 0.5 micron, but good for particles in the 0.26-0.5 micron size range. (Author abstract)

29378 **APTIC NO. 51168**

Prengle, H. William, Jr., Charles A. Morgan, Cheng-Shen Fang, Ling-Kun Huang, Paolo Campani, and William W. Wu

INFRARED REMOTE SENSING AND DETERMINATION OF POLLUTANTS IN GAS PLUMES. *Environ. Sci. Technol., 7(5):417-423, May 1973. 25 refs.*

A remote sensing radiometer spectrometer system, based on Fourier spectroscopy, for the quantitative determination of pollutants in hot gas plumes was developed and tested. General temperature and concentration models were also applied to the determinations. Gas-fired power plant plumes were measured at 65-meter distance, and the concentrations of carbon monoxide, nitric oxide, nitrogen dioxide, methane, and ethylene were determined. Temperatures can be determined to within + or 10 K and concentrations to within + or 20% of the value over the range 10-10,000 ppm. (Author abstract modified)

29379 **APTIC NO. 51592**

Rickards, Anthony L.

ESTIMATION OF SUBMICROGRAM QUANTITIES OF CHRYSOTILE ASBESTOS BY ELECTRON MICROSCOPY. *Anal. Chem., 45(4):809-811, April 1973. 5 refs.*

A sensitive electron microscopic method for estimating the chrysotile asbestos content of the atmosphere was developed, based on recognition of the morphology and electron diffraction patterns of the chrysotile fibers. Quantitative estimates were made by directly observing the dimensions of the chrysotile fibers in the samples and using the theoretical density of chrysotile to calculate the mass of chrysotile in the sample. The technique is capable of measuring down to 0.1 ng/cu m. The method was tested on samples from several rural and urban sites. (Author abstract modified)

29380 **APTIC NO. 51359**

Rijk, M. A. H. and D. van Battum

A FAST METHOD FOR THE DETERMINATION OF BENZO(A)PYRENE IN CURING SMOKES. *(Eine schnelle Bestimmungsmethode fuer Benz-(a)-pyren in Raucharomen). Text in German. Deut. Lebensm. Rundsch., 69(2):75-77, Feb. 1973.*

A rapid method for the determination of benzo(a)pyrene in curing smoke condensates in cured foods is presented. The sample is cooked in ethanol solution of potassium hydroxide, and then cyclohexane is added for the separation of the unsaponifiable residue. The benzo(a)pyrene content of the unsaponiable residue is then enriched by two-step thin-layer chromatography using cellulose acetate layer, 4:4:1 ratio of ethyl ether, methanol, and water as the developing agent, as well as benzene, ether, and methanol for the consecutive extraction of the benzo(a)pyrene spot. Quantitative determination is performed by measuring the fluorescence intensity of the benzo(a)pyrene spot in Flying Spot Densitometer. The thin-layer chromatograms can be photographed by the use of green filter with a transmission band of 400-600 nanom and a maximum transmission at 525 nanom. The sensitivity of the determination method is 10 ppb at an accuracy of 20%.

29381 **APTIC NO. 51317**

Roessler, Johannes

LASERS MEASURE THE AIR POLLUTION. *(Laser messen die Luftverschmutzung). Text in German. Umschau (Frankfurt), 73(11):343-344, 1973. 3 refs.*

Laser radar (lidar) systems can be used to measure solid and gaseous pollution. Lidar can be used to conduct measurements to determine atmospheric alarms. A ruby laser with small transmitter and larger receiver emits a light flash which is reflected by all bodies which it hits. The reflected light is passed from the receiver to a highly sensitive photomultiplier which measures the light intensity. From the light intensity the particle concentration can be determined only by additional assumptions and calculations. The trail of a smoke plume can be easily followed far beyond the visible range. The laser is also used for the measurement of gaseous pollutants such as sulfur dioxide and carbon dioxide. Tunable lasers are required for this.

29382 **APTIC NO. 51233**

Royals, Arthur L., III and Clifford A. Webb, Jr.

PARTICULATE EMISSIONS TESTING OF BARK-OIL FIRED POWER BOILERS. *TAPPI, 56(4):108-111, April 1973. (Presented at the Technical Association of the Pulp and Paper Industry, Environmental Conference, Houston, Tex., May 14-18, 1972.)*

The development of sampling equipment and measuring techniques for determining particulate emissions from bark-oil fired power boilers is described. A large-probe sampler (1 in. dia) was needed to sample gas streams containing large particles which would plug a conventional small-diameter sampler. A sampler was developed which was easy to operate and gave reliable results. Work also showed that weight pickup in wet impingers in a sampling train was not always due solely to particulates. When fuel contains significant amounts of sulfur, most of the material collected in the wet train may be sulfuric acid from sulfur trioxide in the gas stream. Comparative tests of the conventional small-probe sampler and of the new sampler are described. Analysis of wet catch, the calibration of pitot tubes, and a chemical analysis of material caught in condensers are discussed. Testing of the conventional small-probe sampler, the large-probe sampler, and null-probe sampler is described. (Author abstract modified)

29383 **APTIC NO. 51551**

Salyamon, G. S. and M. V. Popelkovskaya

METHODS FOR THE DETERMINATION OF FLUORINE IONS IN AIR AND WATER. *(O metodakh opredeleniya ftor-iona v vozdukh i vode). Text in Russian. Gigiena i Sanit., no. 4:65-67, 1973. 11 refs.*

Twenty five different photocolorimetric methods for the determination of fluorine ions in air, water, and other media were tested for their specificity, accuracy, and reproducibility. Three methods using the respective reagents zirconium eriochrome cyanine; zirconium complex of 4-sulfophenylazo-1,8 dioxynaphthalene-3,6-disulfonic acid; and cerium alizarine complex, were retained as the ones satisfying the above criteria best. Wharton s method using a zirconium complex of 4-sulfophenylazo-1,8-dioxynaphthalene-3,6-disulfonic acid was modified by reduction of the chelate concentration and by addition of thiourea. The cerium alizarine complex method was modified to improve solubility. All three reagents were specific for fluorine even in the presence of several other ions in concentrations of 100 to 10,000 micrograms. The zirconium complex method was more specific than the zirconium eriochrome cyanine and the cerium alizarine complex methods. The zirconium complex and the zirconium eriochrome cyanine methods are suitable for the determination of fluoride dusts and aerosols in the air. An air sample volume of 15-20 l is taken at a rate of 2 l/min for the determination of hydrofluoric acid concentrations. In winter, as well as for the determination of fluorides and fluorine, the Yarovskaya absorber with silicagel is used.

29384 **APTIC NO. 51694**

Sato, Tadashi, Noriko Yamamoto, Hajime Ohara, and Saburo Yanagisawa

DETERMINATION OF PHOSPHORUS (III) AND (V), AND ORGANIC PHOSPHORUS COMPOUNDS IN AUTOMOBILE EXHAUST. *(Jidosha haigasuchu no rin (III), (V) oyobi yuki rin kagobutsu no teiryo). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 22(5):600-602, May 1973. 1 ref.*

The method for the determination of phosphorus (III) and (V), and mixtures of organic phosphorus in automobile exhaust was studied. In order to determine phosphorus by colorimetry with molybdenum blue, it should be in the orthophosphate state. Both phosphorus (III) and organic phosphorus can be oxidized quantitatively to this state with ammonium persulfate in hydrochloric acid; thus, the three types of phosphorus may possibly be determined as the orthophosphate. The organic phosphorus compounds in the presence of the inorganic phosphorus compounds were extracted with ethyl acetate; the phosphorus (III) remaining in the aqueous phase was oxidized; and the sum of the phosphorus (III) and (V) was determined as orthophosphate. By determining the orthophosphate contents in three aliquots taken from the sample, the amounts of the three forms of phosphorus can be caluclated from the differences of the values obtained: without oxidation; by oxidation with ammonium persulfate in hydrochloric acid; and by oxidation of the phosphorus (III) after the extraction of the organic phosphorus. (Author abstract)

29385 **APTIC NO. 51136**

Seany, R. J., R. K. Halpin, and B. A. Maguire

A PORTABLE RECORDING INSTRUMENT (SIMSLIN) FOR MONITORING RESPIRABLE AIRBORNE DUST. *Staub, Reinhaltung Luft, 33(5):213-216, May 1973. 5 refs.*

A prototype safety in mines scattered light instrument (SIMSLIN) is designed to measure the concentration of airborne respirable dust by sensing the radiation scattered by dusty air into a range of angles from 4 to 27 deg to the direction of the collimated beam. The instrument consists of three parts made of aluminum alloy which are screwed together hermetically. They are the source housing, the dust chamber, and the detector housing. A parallel beam of radiation is produced in the source housing and passes through to the dust chamber section. Dusty air is drawn into the dust chamber through an elutriator which eliminates the non-respirable particles. Radiation scattered by dust particles intercepting the beam fall onto the photosensitive surface of a photomultiplier tube, while the radiation that is not scattered is absorbed by a radiation trap. A transparent disc separates the dust chamber from the photomultiplier tube and acts as an air-tight seal. The radiation trap is cemented to the center of the disc. The source of radiation is a small gallium arsenide diode which emits a narrow band of radiation of mean wavelength 0.9 micron at a temperature of 20 C.

29386 **APTIC NO. 51536**

Sigsby, John E., Jr., Francis M. Black, Thomas A. Bellar, and Donald L. Klosterman

CHEMILUMINESCENT METHOD FOR ANALYSIS OF NITROGEN COMPOUNDS IN MOBILE SOURCE EMISSIONS (NO, NO2, AND NH3). *Environ. Sci. Technol., 7(1):51-54, Jan. 1973. 14 refs.*

The development of a chemiluminescent method for the analysis of nitric oxide, nitrogen dioxide, and ammonia in mobile source emissions is discussed. The instrumental design utilizes the principles that NO2 can be thermally dissociated to NO, that ammonia can be oxidized to NO, and that NO can be reacted with ozone to give a detectable light emission, the intensity of which is directly proportional to the mass flow rate of nitric oxide in the reactor. The analytical system and the operation of the chemiluminescent reactor are described. (Author abstract modified)

29387 **APTIC NO. 51562**

Srinivasan, T. N.

QUANTITATIVE ANALYSIS OF SPECIFIC GASES BY MEANS OF A MICROWAVE CAVITY SPECTROMETER. *Phys. Scripta, 7(1/2):84-88, 1973. 15 refs.*

A microwave cavity spectrometer was developed to measure small amounts of gases in mixtures. A Stark voltage is applied to the bottom plate of a cyclindrical brass cavity into which the gas under investigation is injected. The signal output of the spectrometer is directly proportional to the partial pressure of the absorbing gas and independent of the total gas pressure in the cavity. With the present apparatus, 100 ppm of ammonia could be detected in an organic solvent such as methanol. Only the construction of a cavity operating at a particular frequency for each species is required for the detection of organic pollutants such as aldehydes and ketones. Methods of optimization envisaged for a gas, such as sulfur dioxide, with low intensity of absorption include determination of the most intense transition and an automatic injection systems. (Author abstract modified)

29388 **APTIC NO. 51350**

Staszewski, Rafal and Bogdan Zygmunt

SIMPLE DETERMINATION OF HYDROGEN SULPHIDE AND MERCAPTAN SULPHUR IN GASES. *Chem. Anal. (Warsaw), 18(1):85-88, 1973. 7 refs.*

A method for the determination of hydrogen sulfide and mercaptans in gases is examined. The apparatus, reagent preparation, and experimental procedure are reviewed. The simultaneous determination of H2S and mercaptans at concentrations from several ppm to several parts % is calculated from titrimetric analysis. The procedure was tested on gases containing H2S, ethyl mercaptan, and propyl mercaptan; the error of determination was not greater than 2%.

29389 **APTIC NO. 51182**

Tobia, S. K., Y. A. Gawargious, and M. F. El-Shahat

NEW SPOT-TEST FOR CYANIDE ION AND CYANOGEN GAS. *Talanta, 20(5):513-514, May 1973. 11 refs.*

A rapid and simple spot test was developed for the determination of the cyanide ion and cyanogen gas. The technique is based on the reaction of the cyanide ion with ammonium molybdate-copper(II) solution in an acetic acid medium to give a blue color. The reaction is sensitive down to 0.15 microgram of cyanide in a 0.1 ml drop without the need for any special equipment. The reaction conditions and the interference of other anions and cations are examined.

29390 **APTIC NO. 51599**

Warner, Theodore B. and David J. Bressan

DIRECT MEASUREMENT OF LESS THAN 1 PART-PER-BILLION FLUORIDE IN RAIN, FOG, AND AEROSOLS WITH AN ION-SELECTIVE ELECTRODE. *Anal. Chim. Acta, 63(1):165-173, Jan. 1973. 21 refs.*

A potentiometric method for the determination of fluoride in rain, snow, fog, and aerosols in samples containing as little as 0.28 ppb was developed using a lanthanum fluoride electrode. The method involves little sample handling, takes 15-22 min for a determination, and can be extended over eight decades of concentrations. Probable uncertainty ranges from 10-20%

near 0.28 ppb to 3-6% above 100 ppb. (Author summary modified)

29391 **APTIC NO. 51143**

Weisz H. and A. Brockhaus

A METHOD FOR DETERMINATION OF 2-NAPHTHOL IN PARTICULATES FROM URBAN AIR. *(Nachweis und Bestimmung von 2-Naphthol im Grossstadtaerosol). Text in German. Zentralbl. Bakteriol., Parasitenk. Infektionskr. Hyg.:-Abt. 1:Orig., Reihe B, 157(1):28-33, 1973. 9 refs.*

A method for determining 2-naphthol in urban air is described. The 2-naphthol is coupled with diazotised p-nitroaniline under specified conditions and the obtained azo dye is extracted into dichloromethane. The methods used for separation are: thick layer chromatography, ascendent paper chromatography, using paper impregnated with paraffin, and thin layer chromatography on TLC-aluminum sheets polyamide. Eluents are benzene, acetone-water (7:3), and benzene. A good solvent for the azo dye containing areals is dichloromethane. The azo dye is then determined colorimetrically by using a spectrophotometer. As little as 4 micrograms of 2-naphthol in 1 g of particulate matter can be quantitatively determined by this method. The concentration of 2-naphthol in the air is from 0.19 to 1.21 ng/cu m. The values for other organic components are lower in summer than in winter.

29392 **APTIC NO. 51434**

Wojtasiewicz-Obrzut, Danuta

METHOD OF YIELD DETERMINATION OF AMMONIA COMBUSTION TO NITROGEN OXIDES, EVALUATION OF ACCURACY. *(Ocena dokladnosci metod oznaczania wydajnosci spalania amoniaku do tlenkow azotu). Text in Polish. Chem. Anal. (Warsaw), 18(1):91-98, 1973. 5 refs.*

The gravimetric method is described, with special attention on the weight of the flasks, dimensions, and procedures ensuring dependable results. The relative error of the gravimetric method was found by preliminary mathematical analysis and statistical evaluation of the results of analyses. The relative error was determined to be from plus or minus 0.5-1.1% in the case of using 500 cu cm capacity flasks weighing 80-100 g, and from plus or minus 0.3-0.7% in the case of using 1000 cu cm capacity flasks weighing about 300 g. The gravimetric method was compared to the volumetric method, which was characterized by a larger error determined both by mathematical and statistical analyses.

29393 **APTIC NO. 51668**

Yamashita, Tadashi

POLLUTION CONTROL TRANSDUCERS IN PROCESS INDUSTRIES. *(Purosesu kogyo ni okeru kogai boshiyo toransudusa). Text in Japanese. Keisoku to Seigyo (Meas. Control), 12(1):54-60, Jan. 1973. 4 refs.*

Some of more recently developed transducers especially designed for pollution control are reviewed. The principles of some of new processes for emission source monitoring analyzers are given. For sulfur dioxide, a flame photometric detector or the ultraviolet absorption method is used instead of the previous electroconductivity method or the infrared absorption method. These methods are used for monitoring of boiler flue gas or desulfurization. For nitrogen oxides, chemiluminescence or ultraviolet absorption is used instead of the Saltzman or infrared method. For hydrogen sulfide, flame photometric detection or absorption is used instead of acetic acid lead filter paper or coulometry. Dusts are monitored by the light scattering particle counter instead of the filter paper weight method or dust tube. The principles of chemiluminescence, ultraviolet absorption, flame photometry, and cyanogen ion electrodes are explained, and some examples of usage are presented.

29394 **APTIC NO. 51672**

Yanagihara, Shigeru

POLLUTION CONTROL TECHNIQUE FOR AUTOMOTIVE EMISSION AND TRANSDUCERS. *(Jidosha haiki no kogai boshi gijutsu to toransudusa). Text in Japanese. Keisoku to Seigyo (Meas. Control), 12(1):61-69, Jan. 1973.*

The principles of non-dispersion infrared analyzer, flame ionization detector, and chemiluminescence are discussed. For automotive emission measurement, measuring low concentration material has become extremely important. This is achieved accurately only by amplification. Therefore, in all areas of precision measurement and control equipment, the role of transducers is extremely important and indispensable.

1972

29395 **APTIC NO. 51038**

Baird-Atomic, Inc., Bedford, Mass.

IMPROVEMENT OF OPTICAL EFFICIENCY OF LUMINESCENCE OF A FLAME PHOTOMETRIC DETECTOR. (FINAL REPORT). *Environmental Protection Agency Contract EHSD 71-50, EPA-R2-73-193, 273-5401, 40p. Dec. 1972.*

NTIS: PB 220480

The optical efficiency of the Melpar flame photometric detector for the detection of sulfur dioxide s efficiency studied, should lead to higher sensitivity, stability, and freedom from interference. The spatial distribution of sulfur and background emissions were plotted to establish regions of greatest signal/background. Multi-slits were constructed to match the structured sulfur emission and allow background substract. The spatial studies of sulfur and background emission demonstrated that the optimum signal/background is obtained below the geometric center of the standard burner. The distribution suggested use of a monochromator with horizontal entrance slit rather than a filter. Unfortunately the distribution is not constant with time, being related to the buildup of deposits in the burner. A study of the line emission of sulfur demonstrated that multiple slits could be constructed which would both increase specificity for sulfur and increase the usuable signal. A comparison of the multiple slits with a single slit of the same spectral bandpass indicated an increase of about three in sensitivity. The differential mode, using the multi-slits, was not as successful as hoped, for a variety of reasons. First, the quartz plate introduced some defocussing. Together with the slightly oversized slits employed, this resulted in decreased differential signal. Defects in the burner and electronics of the standard instrument limited the results to a demonstration of the successful implementation of the basic principles. Using multi-slits in the non-differential mode, the final sensitivity was about an order of magnitude greater than the comparison standard instrument (or about three times more sensitivity for SO2). (Author summary modified)

29396 **APTIC NO. 51076**

Avdyukova, N. V., T. P. Antsiferova, and L. D. Loyko

A QUICK PHOTOMETRIC METHOD FOR DETERMINING FORMALDEHYDE IN AIR CONTAMINATED WITH EXHAUST GASES. *(Bystryy fotometricheskiy metod opredeleniya formal dehida v vozdukhe, zagryaznennom vykhlopnymi gazami). Gigiena i Sanit., vol. 37:69-71, Sept. 1972. 4 refs. Translated from Russian, 3p.*

A photometric method for determining formaldehyde in air contaminated with exhaust gases is described. Chromotropic acid in a sulfuric acid medium is used. The dependence of the optic density of a solution on the concentration of sulfuric acid in the reaction mixture was studied. Optimum concentration was 60-70% H2SO4 by volume; the sensitivity of the reaction was considerably raised and the stain developed in several minutes without additonal heating. Stricter reaction conditions did not affect the nature of the stained product or the specificity of the reaction. Two variants to the method were studied f- with concentrations of sulfuric acid of 70 and 36% by volume. The high sensitivity of the method makes it possible to sample air in the open pit by vacuum means. Air sampling analysis is described. The amount of formaldehyde in the sample was determined by using a calibration graph, plotted for the standard solution of formaldehyde in water with a concentration of 0.01 m/ml. The standards solution was prepared by diluting the formaldehyde solution with a known concentration, established iodometrically. The chromotropic method analyzes formaldehyde more accurately than the fuchsin sulfuric acid method.

29397 **APTIC NO. 51571**

Carpenter, T. E. and D. L. Brenchley

A PIEZOELECTRIC CASCADE IMPACTOR FOR AEROSOL MONITORING. *Am. Ind. Hyg. Assoc. J., 33(8):503-510, Aug. 1972. 22 refs.*

A four-stage cascade impactor was designed, constructed, and calibrated for determining the particle size distribution of aerosols, based on the observation of the frequency of shift of piezoelectric quartz crystals caused by the deposition of particles onto them by inertial impaction. The cutoff sizes for unit density are at 18.9, 12.6, 6.3, and 2.5 micron. (Author abstract modified)

29398 **APTIC NO. 51339**

Chang, Richard K. and Daniel G. Fouche

GAINS IN DETECTING POLLUTION. *Laser Focus, 8(12):43-45, Dec. 1972. 12 refs.*

The development of a remote detection system for measuring hydrocarbons at an exhaust pipe of automobile is described. A laser system can provide more information and can be inexpensive. Raman scattering requires only a single laser wavelength to detect all pollutants. It operates at visible wavelengths where the atmosphere is transparent. Two major improvements are required of the Raman techniques: enhancement of the scattering efficiency, which will require more understanding of the Raman scattering; and fluorescence processes. Absolute data on scattering efficiency is important in translating the detected Raman signal into parts per million. Several laboratories in the U. S. and in Japan are measuring the absolute or relative scattering efficiencies of pollutant gases at several wavelengths.

29399 **APTIC NO. 51079**

Dyachuk, I. A.

THE USE OF A FIVE-POINT SYSTEM TO DETERMINE VOLATILE SUBSTANCES, RELEASED BY POLYMERS, IN ROOM AIR. *(O premenenii pyatiballnoy sistemy dlya opredeleniya v vozdukhe pomeshcheniy letuchikh veshchestv, vydelyaemykh polimerami). Gigiena i Sanit., 37(10):97, Oct. 1972. 4 refs. Translated from Russian, 5p.*

A five-point system was developed to determine the approximate content of volatile substances, released by polymers, in rooms by the presence and intensity of odor. The evaluation ranged from no perceptible odor to intense odor with irritation of eyes and respiratory passages. The method was tested in rooms with floors covered by polyvinyl chloride tiles which released dibutylphthalate, and the results were compared with laboratory data on the DBP content of the rooms.

29400 **APTIC NO. 51457**

Freedman, Robert W. and Andrew G. Sharkey, Jr.

RECENT ADVANCES IN THE ANALYSIS OF RESPIRABLE COAL DUST FOR FREE SILICA, TRACE ELEMENTS, AND ORGANIC CONSTITUENTS. PART I. COAL MINE DUST. *Ann. N. Y. Acad. Sci., vol. 200:7-16, Dec. 1972. 15 refs.*

Analytical techniques are described for three classes of materials that may be involved in the development of pneumoconiosis in coal miners. The classes are free silica, major and trace elements, and organic compounds. Broad size-range silica is available in minerals and is analyzed in relatively large quantities. The method of choice is usually X-ray diffraction, using several hundred mg samples. For more specialized analysis involving only a few mg of respirable coal dust collected on a filter, infrared analysis is preferable. Direct analysis on membrane filters appears feasible, based on pure alpha quartz filter standards. Analytical methods for elements include atomic absorption, polarography, ring oven, spark-source mass spectrometry, emission spectroscopy, X-ray fluorescence, and neutron activation. It is expected that emission spectroscopy will become the mainstay for rapid sensitive routine analysis for trace elements. X-ray fluorescence holds promise for confirmatory analysis, mainly of major elements in coal dust, while neutron activation provides a promising backup capability for other analytical methods. High-resolution mass spectrometry is used to determine the chemical composition of whole coal, respirable-size coal dust, and mine dust. A major advantage of the technique for studies of organic materials in coal dust is that molecular formulas for hundreds of dust components can be obtained without prior separation of the sample. The detailed information obtainable by high-resolution mass spectrometry is shown by a partial mass spectrum of pyridine extract.

29401 **APTIC NO. 51703**

Johnson, Bruce A. and C. Paul Roper

THE EVALUATION OF GAS DETECTOR TUBE SYSTEMS: CHLORINE. *Am. Ind. Hyg. Assoc. J., 33(8):533-534, Aug. 1972. 3 refs.*

Detector tubes from all manufacturers which market tubes in the United States for detection of free chlorine were evaluated for acceptable performance, provided the tubes were intended for use in the concentration range of one-half to five times the threshold limit value (TVL). Only those tubes meeting the accuracy and precision standards for evaluation are listed. Those tubes not listed did not meet the evaluation criteria for acceptable performance. (Author abstract)

29402 **APTIC NO. 51575**

Knight, Geoffrey

A SIMPLE METHOD FOR DETERMINING SIZE DISTRIBUTION OF AIRBORNE DUST BY ITS SETTLING VELOCITY. *Am. Ind. Hyg. Assoc. J., 33(8):526-532, Aug. 1972. 6 refs.*

A simple graphical technique for determining the size distribution parameters for gravimetric or other measurement of dust collected by samplers fitted with size selectors was developed. The theoretical basis of operation, experimental procedures, and preliminary results are reviewed. The technique was tested on dust clouds of coal, pyrite, asbestos, uranium ore, diabase and limestone. (Author abstract modified)

29403 **APTIC NO. 51040**

Linford, Gary J.

LASER EXHAUST MEASUREMENT PROGRAM. FINAL REPORT. *Laser Technology, Culver City, Calif., Environmental Protection Agency Contract 68-02-0203, Program Element A11010, EPA-R2-72-136, 69p., Sept. 1972. 15 refs.*

NTIS: PB 220429

The theory of Laser Exhaust Measurement (LEM) system operation, a detailed description of the operating characteristics of the equipment, and a general operating manual for the entire LEM system are presented. The construction and operation of each LEM subsystem and/or component is briefly described. The proper operating procedures are clearly detailed to prevent malfunctions or possible damage to the

LEM apparatus. Certain minimal risks to operating personnel are present in the LEM apparatus, and hazardous locations and/or poor operational procedures are labeled and described. These risks are principally associated with the relatively high-pressure cooling water for the magnet, the moderately high laser excitation voltage, and the large magnetic fields present near the ends of the magnet solenoid. The data processing system is described. The LEM system measures formaldehyde and aldehydes.

29404 **APTIC NO. 51569**

Meijer, P. B. and W. E. de Koning-Pierens

DETECTION AND MEASUREMENT OF THE CONCENTRATION OF ASBESTOS IN AIR. *TNO-Nieuws, 27(11):661-666, Nov. 1972. 21 refs.*

The qualitative and quantitative aspects of the detection of asbestos fibers were studied with respect to measurement methods for the determination of asbestos in the ambient air and under industrial conditions. The theory of operation, basic principles, and experimental procedures of asbestos determination using X-ray diffraction, infrared spectroscopy, scanning electron microscopy, and electron diffraction analysis are reviewed.

29405 **APTIC NO. 51407**

Ohira, Toshio

FAILURE ANALYSIS OF AUTOMATIC MONITORING AND MEASUREMENT APPARATUSES AND COUNTERMEASURES. (THE 1971 COMMISSIONED PROJECT ON PUBLIC NUISANCE BY THE JAPAN ENVIRONMENTAL AGENCY, BUREAU OF ATMOSPHERIC SAFETY). *(Jido kanshi sokuteikiki no kessoku yoin to sono shochi ni kansuru kenkyu (Showa 46-nendo kogai chosa kenkyu itaku, kankyocho taiki hozenkyoku)). Text in Japanese. All Japan Pollution Research Council, 255p., March 1972. 8 refs.*

The causes for measurement failures for air pollution automatic monitoring apparatuses and the countermeasures were studied for 10 prefectures and nine cities, and the results and analyses are presented in tables and discussions. The investigation involved 243 sulfur oxides measuring apparatuses and 143 suspended particle measuring apparatuses. Only two autonomous monitoring agencies had less than 5% failure for SOx measuring apparatuses in 1969 and only six in 1970. Those with between 5.1 and 10% failure frequency were nine in 1969 and six in 1970, and seven each for both years had more than 10% failure frequency. With regard to suspended particulate measuring apparatuses, only one station had less than 5% failure in 1969 and two in 1970; those with more than 10% failure frequencies were five in 1969 and 10 in 1970. The absence of air conditioners in the monitoring station tended to cause failure of the apparatuses for suspended particulates. In general, the more frequent the maintenance inspections, the less failures occurred. With SOx, the equipment in use for more than 4 years had a higher rate of failures; however, in some cases 1-year old equipments had just as many failures as those in use for 2 or 3 years. Equipment for suspended particulates showed no relationship between the age and failure frequency. The highest ratio of failures were caused by damages on parts and by poor maintenance. Quite often, failures were caused by troubles with the telemeter connections. With the theoretical failure frequency and unexpected causes, failures should be controlled to less than 3%.

29406 **APTIC NO. 51524**

Proctor, T. D.

THE USE OF A GAS LASER FOR SIZING SINGLE PARTICLES OF AIRBORNE DUST. *J. Phys. E., 5(12):1226-1229, Dec. 1972. 7 refs.*

The theory, design, and experimental operation of a gas laser for the determination of particle sizes of airborne dust are examined. The single particles are passed through the main beam of a gas laser and the resultant pulses in the intensity of the output beam of the laser are used as a measure of particle size. The size of an individual pulse is related to the scattering properties of the particle and the characteristics of the laser system. (Author abstract modified)

29407 **APTIC NO. 51698**

Reist, Parker C. and Homer M. Cole

A SIMPLE PROCEDURE FOR THE ROUTINE TESTING OF RESPIRATOR SORBENTS. *Am. Ind. Hyg. Assoc. J., 33(8):523-525, Aug. 1972. 3 refs.*

A simplified procedure for testing respirator sorbents for breakthrough when used against specific toxic gases is described. Detector tubes were used in a qualitative method as indicators of leakage or breakthrough. No special equipment or techniques are required other than the test gas, the detector tubes, and the simplified testing apparatus. The procedure is applicable to any gases for which suitable detector tubes are available, and the change from one test to another can be made simply and rapidly. Comparative tests with sulfur dioxide showed good agreement with the conductivity method. The new experimental apparatus is described and results of the comparative tests listed. (Author abstract modified)

29408 **APTIC NO. 51356**

Stedman, Dwigt

CONTINUOUS ANALYSIS OF AIR POLLUTANTS BY CHEMICAL METHODS UTILIZING THE PRINCIPLES OF CONTINUOUS FLOW. *Chim. Ind. (Milan), 54(12):1121-1124, Dec. 1972. (Presented at the Giornate della Chimica 1972, 23rd Congress, Milan, April 19-20, 1972.)*

Chemical methods for the continuous analysis of air pollutants are described. Accurate and reliable data are obtained with these methods. The method employed is specific for the pollutant measured and no sample treatment prior to analysis is required. Chemical methods are widespread throughout the world and obtaining continuous data by the same method allows the easy correlation to previously obtained manual data. Continuous and automatic monitoring of an air pollutant using wet-chemical methods is described. The Saltzman (Lyshkow modification) procedure, and the Jacobs-Hochheiser procedure for the analysis of nitrogen dioxide are described. The adaptability of chemical methods by continuous flow analysis is good insurance against instrument obsolescence.

29409 **APTIC NO. 51674**

Takagi, Shigehide

CHARACTERIZATION TECHNIQUES FOR THE SMALL AMOUNT OF MATERIALS IN THE CERAMIC INDUSTRIES ENVIRONMENT. *(Yogyo ni kanren shita kankyo seigyo no tame no biryo sokutei gijutsu). Text in Japanese. Seramikkusu (Ceramics), 7(12):938-941, 1972. 3 refs.*

A general discussion is given of the analysis of particulates in air. The most popular method employed at the present time is atomic absorption spectrophotometry which is a rather indirect method since it requires preliminary prediction of the existing metals by emission spectrometry. Results of the analyses of various metals in urban dust reveal that laser spectrophotometry is excellent for the analysis of magnesium, aluminum, and chromium and good for iron and silicon. The X-ray fluorescent method is good for Al, Si, potassium, calcium, Cr, and Fe. The two methods and emission spectrometry are also applicable for the determination of many other metals. Cascade impactors, dust counters, and other methods are mentioned.

29410 **APTIC NO. 51420**

Tsuji, Kusuo

STUDIES ON THE SUSPENDED PARTICLES IN AIR. II. DETERMINATION OF ZINC, CADMIUM, LEAD AND COPPER IN AIR BY LOW TEMPERATURE RADIO FREQUENCY OXIDATION APPARATUS AND ATOMIC ABSORPTION SPECTROPHOTOMETER. *(Taikichu no fuyu funjin ni kansuru kenkyu (Dainiho): Teion kaika sochi to genshi kyukoho ni yoru fuyu funjinchu no aen, kadomiumu, namari, do no teiryo). Text in Japanese. Eisei Shinkensho Hokoku (Bull. Natl. Inst. Hyg. Sci., Tokyo), no. 90:33-38, Nov. 1972. 4 refs.*

Satisfactory results were obtained for the direct determination of zinc, cadmium, lead, and copper in air using a low temperature radio frequency oxidation apparatus and an atomic absorption spectrophotometer. The fine particles of dust on the surface of a glass fiber filter or polystyrene fiber were ashed by a low temperature radio frequency oxidation apparatus under the oxygen flow rate of 70 ml/min, output power of high frequency 150 watts; ashing time of 3 hours, and temperature in the chamber of 100 C. The metals in the sample were extracted with 10 ml of hydrochloric acid. This extracted solution was diluted to the required concentration for the experiment with 0.1 N nitric acid, and this solution was used as the sample solution for the atomic absorption spectrophotometry. Determination of four kinds of metals in air were carried out by an atomic absorption spectrophotometer with the air-acetylene flame method. This simplified procedure was accompanied with high recovery percentage.

29411 **APTIC NO. 51446**

Tsuji, Kusuo, Yasuo Suzuki, Masuo Tobe, Masaharu Tonomura, Yasuko Emoto, Masaru Saito, Mikio Araki, and Manabu Muramatsu

STUDIES ON THE SUSPENDED PARTICLES IN INDOOR AIR. I. DETERMINATION OF METALS BY ATOMIC ABSORPTION SPECTROPHOTOMETRY. *(Shitsunai kukichu no fuyu funjin ni kansuru kenkyu (Daiippo): Genshi Kyukoho ni yoru kinzoku no teiryo). Text in Japanese. Eisei Shikensho Hokoku (Bull. Natl. Inst. Hyg. Sci., Tokyo), no. 90:20-27, Nov. 1972. 10 refs.*

Metal contents in suspended particles in indoor air were measured by using a low temperature radio frequency oxidation apparatus and an atomic absorption spectrophotometer. The suspended particles caught on the surface of glass fiber filter were ashed by a low temperature radio frequency apparatus, after being extracted with hydrochloric acid. Calcium, magnesium, zinc, iron, and mangenese were determined by the direct method. Lead, cadmium, cobalt, nickel, and copper were determined after being extracted with a sodium diethyl dithiocarbamate-methyl isobutyl ketone system. The absorption was proportional to metal concentration for each metal within the following range in micrograms/ml: calcium 0.5 to 5.0, magnesium 0.05 to 0.3, zinc 0.1 to 0.5, iron 0.5 to 5.0, manganese 0.5 to 2.0, cadmium 0.05 to 0.3, cobalt 0.01 to 1.0, nickel 0.05 to 1.0, and copper 0.1 to 1.0. Calibration curves are given.

29412 **APTIC NO. 51429**

Young, Richard A.

COMPUTERIZED GC/MS FOR PRECISE POLLUTION ANALYSIS. *Pollut. Eng., 4(9):32, Dec. 1972.*

The gas chromatograph/mass spectrometer combination is a powerful analytical tool; but its application to pollution analysis has been very complex, limited, and always expensive. Difficulties of complex data handling in GC/MS pollution analysis can be solved by application of PDP-8 minicomputer from Digital Equipment Corporation. The computer has the ability to continuously scan the GC output every 3 sec or less, whether a peak is occurring or not. The result is five or six spectra under every peak. The computer then presents data that is ready for analysis, eliminating many hours of manual work. The computer also reduces the chances of operator mistakes in the process. The computer, if programmed beforehand with the specific characteristics of the suspected pollutants, can automatically search the entire spectrum and make a positive identification. The economic implications of the computerized GC/MS system are far-reaching. By precisely measuring its own pollutants, a company can better relate pollution control costs to the degree of pollution reduction required.

1971

29413 **APTIC NO. 51462**

Howes, James E., Jr., Harvey S. Rosenberg, and Robert A. Ewing

REACTION CELL IMPROVEMENTS IN THE MERCURY SUBSTITUTION-NUCLEAR DETECTION SULFUR DIOXIDE STACK GAS MONITOR. (FINAL REPORT). *Battelle, Columbus, Ohio, Columbus Labs., Atomic Energy Commission Contract W-7405-eng-92, Rept. TID-25850, 40p., Oct. 14, 1971. 7 refs.*

A prototype instrument designed to measure sulfur dioxide concentrations in stack gas, based on the reaction of SO2 with a slurry of mercurous chloride to form a soluble sulfite-mercury complex for subsequent quantitative determination by X-ray absorption, was tested and improved. In initial tests, major problems were encountered in the operation of the reaction cell, including excessive foaming, difficulty in filtering the solution, and slow response time. A modified reaction cell system was developed and is examined with respect to design, operation, and experimental procedure. (Author summary modified)

29414 **APTIC NO. 51629**

Smith, Terry and Ronald Draftz

PARTICULATE EMISSIONS FROM TWO LIMESTONE WET SCRUBBERS. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:1073-1082. 5 refs. (Nov. 8-12.)*

The mass emission levels, size distribution, and chemical composition of particulates emitted from limestone wet scrubbers at power plants were studied. Samples were collected using a stack sampler and cascade impactor (Andersen sampler) and were analyzed for size by optical and electron microscopy and for chemical composition by X-ray fluorescence analysis and X-ray diffraction analysis. Half of the emissions from the flooded bed scrubber were smaller than 1.6 micron in diameter. The mass average diameter of the particulates from the pilot plant scrubber was 0.8 micron. A large majority of both particulate emissions was calcium sulfate. (Author abstract modified)

29415 **APTIC NO. 51630**

Smith, Terry and Hsing-Chi Chang

DESIGN CRITERIA FOR A SIZE-SELECTIVE SAMPLER FOR LIMESTONE WET SCRUBBERS. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:1083-1095. 10 refs. (Nov. 8-12.)*

The design and operation of a gravimetric size-selective cyclone sampler, for determining particulate emissions from limestone wet scrubbers are examined. Gas stream conditions, sampling methods, sizing procedures, and data analysis are reviewed. (Author abstract modified)

29416 ***APTIC NO. 51631***

Statnick, R. M. and J. A. Dorsey

INSTRUMENTAL METHODS FOR FLUE GAS ANALYSIS. Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol. II:1097-1108. (Nov. 8-12.)

The application of continuous monitoring techniques to pilot plant and fuel scale evaluations of control technologies for power plants was examined with respect to sampling, sample handling, and instrument selection. Sampling probes for flue gas sampling and filters for particulate sampling were tested. The various methods included nondestructive infrared and ultraviolet spectrometry, coulometric methods, and electrochemical methods for sulfur dioxide monitoring and NDIR, NDUV, and electrochemical methods for nitrogen oxide monitoring.

1970

29417 **APTIC NO. 51476**

Juda, J.

AN APPROACH TO SYSTEMATIC MEASUREMENTS OF THE ATMOSPHERIC AIR POLLUTION. *(Metodyka pomiarow zanieczyszczenia powietrza atmosferycznego). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(4):9-16, 1970. 4 refs. (Presented at the French-Polish Symposium on Air Pollution Control, Paris, France, 0Nov. 17-21, 1969.)*

NTIS: TT 70-55124/4

An approach to systematic measurements of the atmospheric pollution level is outlined and explained. The major parameters for maximum accuracy include the number of sampling points, duration of a single measurement, frequency of measurements at individual sampling points, measuring period, data analysis, and measuring technique. The application of the approach to field measurements is examined.

29418 **APTIC NO. 51478**

Martin, M.

METHODS OF DETERMINING THE CONTRIBUTION OF NEW SOURCES OF EMISSION TO THE ATMOSPHERIC POLLUTION LEVEL. *(Metody ustalania wplywu nowych zrodel emisji na stan zanieczyszczenia atmosfery). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(5):43-49, 1970. (Presented at the French-Polish Symposium on Air Pollution Control, Paris, France, Nov. 17-21, 1969.)*

NTIS: TT 70-P55124/5

Methods to determine the contribution of a new emission source to the level of air pollution in a given area are examined. Two practical cases are considered: a new emission source in a nonindustrialized area, where the pollution measured is completely attributed to the new source, or a new emission source in an industrial area, increasing the existing emission level. In both cases, the contribution is determined by measuring the concentration of pollutants disseminated in the area downwind of the source. The formulas must consider the aerodynamic phase, i.e., emission source measurements, and the meteorological phase, i.e., wind velocity, periods of inversion, humidity, precipitation, and insolation. Various sampling and measurement techniques are reviewed, including scrubber sampling, electroconductivity analysis, infrared spectrometry, filtration, and colorimetry. Data analysis methods are considered.

29419 **APTIC NO. 51477**

Ryszka, E. and S. Gajda

ISOKINETIC AND NONISOKINETIC SAMPLING OF PARTICULATES IN FLUE GASES *(Izo- i anizokinetyczne pomiary zapylenia spalin). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(5):50-58, 1970. 20 refs.*

NTIS: TT 70-P55124/5

The dust content of combustion gases from a sintering plant was measured by isokinetic and nonisokinetic sampling probes. The design and operation of the sampling procedure are examined. The effects of various sampling conditions were also studied, including flue gas temperature, velocity, and pressure, flow rates, and chemical composition of the flue gases.

1964

29420 **APTIC NO. 51482**

Vitols, Valentin

DETERMINATION OF THEORETICAL COLLECTION EFFICIENCIES OF ASPIRATED PARTICULATE MATTER SAMPLING PROBES UNDER ANISOKINETIC FLOW. *Michigan Univ., Ann Arbor, Dept. of Health Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1964, 244p. 80 refs.*

Theoretical collection efficiencies of aspirated sampling probes under various conditions of anisokinetic flow were determined by calculating the trajectories of particles as they are carried by free stream fluid toward the sampling probe. The trajectory calculations involved determining fluid velocity fields by matrix interactive solutions of a Laplace-type equation for Stokes stream function, writing particle motion equations accounting for all mechanisms exerting significant influence on particle collection, and solving the equations with an analog computer. The derived equations assumed that particle collection by aspirated probes was due entirely to inertia; that particles were monodisperse and spherical; and that free stream flow was steady, incompressible, and irrotational. The investigation demonstrated that ideal fluid approximation of actual gas flow patterns for various anisokinetic flow situations is reasonable for gas stream velocities and probe sizes encountered in practice. Theoretical results and experimental data on zinc sphere test dust were in good agreement, but there was a trend toward theoretical overestimation of errors in sampled concentrations. Causes for the overestimation may include nonsphericity of particles, turbulence in the gas stream, variability of drag during periods of particle acceleration, and sampling with blunt-nosed probes. Expanded experimental information is needed to ascertain the reliability of theoretical determinations over the entire range of sampling variables encountered in practice.

1959

29421 **APTIC NO. 51647**

Kopplin, Julius Otto

SURFACE POTENTIAL CHANGES CAUSED BY THE ADSORPTION OF ODOROUS MATERIAL FROM THE ATMOSPHERE. *Purdue Univ., Lafayette, Ind., Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Jan. 1959, 95p. 23 refs.*

The changes in surface potential of various surfaces caused by the adsorption of different odorous materials were investigated to determine the feasibility of detecting and identifying various vapors through the measurement of surface potential changes caused by their adsorption, and also for establishing relationships between the physical properties of the adsorbable molecules and surface potential change due to their adsorption. The Kelvin method of measuring contact potential differences was used. A filtered air stream, the humidity of which was variable and controlled and into which could be injected a measured amount of contaminant vapor, was passed between two parallel electrodes. The upper electrode surface was desensitized with a coating of paraffin wax so that detectable amounts of adsorption and surface potential change took place only on the lower electrode surface. Surface potential changes at the lower surface were measured using the vibrating capacitance null balance technique. Various liquids were used to form the adsorbing surface with extensive use being made of distilled water. Different normal homologous alcohol vapors (of 2, 3, 4, 6, and 8 carbon-chain lengths) were individually injected into an air stream in amounts from 0.08 to 800 ppm by volume. The vapors were adsorbed from the air stream into a distilled water surface and the change in surface potential of the water was noted. A linear relationship was established between the logarithm of the vapor concentration in ppm in the air stream and the change in surface potential in millivolts for each of the alcohol vapors. Results of experiments are discussed. (Author abstract modified)

AIR QUALITY MEASUREMENTS

1973

29422 **APTIC NO. 51659**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

RESULTS OF ENVIRONMENTAL SURVEY ON AND ABOUT INTERSECTION LOCATED AT MOUTH OF ITSUKAICHIGAIDO STREET IN SUGINAMI WARD. *(Suginami-ku itsukaichigaidoko kosaten fukin kankyochosa kekka). Text in Japanese. 10p., May 1973.*

In 1972 the carbon monoxide at an intersection of Suginami Ward in Tokyo exceeded the desired control level of 100 ppm/mo. Measurements in 1973 taken from March 10 to April 6 indicate that the monthly average of daily CO concentrations decreased and is now below the desired levels at all measuring spots including the intersection. The CO values were 6.4 ppm at the intersection, 4.88 ppm at the roadside, and 2.4 ppm in the area behind the street, while they were 11.4, 9.2, and 6.0, respectively in 1972. Weather conditions were studied to determine any correlation between weather and CO concentrations.

29423 **APTIC NO. 51347**

Balabuyev, A. G., O. V. Lomaya, and D. G. Tsintsadze

ANNUAL AND DIURNAL COURSE OF THE CONCENTRATION OF ATMOSPHERIC SOLID AEROSOLS OVER A CITY. *(Godovoy i sutochnyy khod kontsentratsii atmosfernykh aerozoley v gorodskikh usloviyakh). Text in Russian. Soobshch. Akad. Nauk Gruz. SSR, 69(3):585-589, 1973. 5 refs.*

The annual and diurnal solid aerosol concentrations over Tbilisi were studied in the 1967-1971 period by using the gravimetric method of aerosol determination. Pronounced annual variations of the aerosol concentrations, with maximums in December through January, and minimums in July through August, were determined. The winter maximum is due to increased fuel consumption. The difference between winter maximum and summer minimum was about 20%. The average aerosol concentration increased by about 30% during the test period, and so did median values and mean square deviations. While averages obtained at different sampling stations in the city were different, identical trends of the diurnal concentration variations with a correlation factor of 0.84 were observed. Dust concentration measurements taken 10 times daily over one year revealed three types of diurnal concentration variations that were not seasonally conditioned (two minima between 3 and 5 am and between 2 and 3 pm, and two maxima between 9 and 11 am and at 7 pm in 54%; one maximum between 9 am and 7 pm and one minimum in the night in 36%; as well as steady diurnal concentrations in 14 cases).

29424 **APTIC NO. 51243**

Burgess, William, Louis DiBerardinis, and Frank E. Speizer

EXPOSURE TO AUTOMOBILE EXHAUST. III. AN ENVIRONMENTAL ASSESSMENT. *Arch. Environ. Health, 26(6):325-329, June 1973. 5 refs.*

Contaminants which reflect exposure to automobile exhaust, including nitrogen dioxide, carbon monoxide, total hydrocarbons, respirable particulates, and lead, in addition to the general contaminant, sulfur dioxide, were sampled at traffic officer work stations in Boston. Sampling was conducted with a portable instrument which could be positioned at the street location. Seasonal data collected at 16 representative work stations revealed the expected diurnal and seasonal trends in these contaminants, and demonstrated that street level air sampling is needed to accurately measure the exposure of traffic officers to automobile exhaust. Air sampling methods are described. (Author abstract modified)

29425 **APTIC NO. 51712**

Collins-Williams, C., H. K. Kuo, E. A. Varga, S. Davisdon, D. Collins-Williams, and M. Fitch

ATMOSPHERIC POLLEN COUNTS IN TORONTO, CANADA, 1971. *Ann. Allergy, 31(2):65-68, Feb. 1973. 4 refs.*

Daily atmospheric pollen counts were determined in Toronto for 1971. The sampling and analytical techniques are reviewed. The tree pollen season extended from the first week of April to the middle of July with the peak in early June; the grass season from the first week of May to the end of July with the peak in the middle of July; the ragweed season from the second week of August to the middle of September with the peak in the first week of September. Miscellaneous weed pollens were determined from the middle of May to the first week of November. Pollen counts for the common tree species, comparisons with pollen patterns in 1954, and pollen counts for the miscellaneous weed pollens are discussed.

29426 **APTIC NO. 51175**

Derwent, R. G. and H. N. M. Stewart

ELEVATED OZONE LEVELS IN THE AIR OF CENTRAL LONDON. *Nature (London), 241(5388):342-343, Feb. 2, 1973. 7 refs.*

The air quality of central London was monitored with respect to measurements of ozone, nitric oxide, nitrogen dioxide, carbon monoxide, total gaseous sulfur compounds, and total hydrocarbons. Weather conditions were also studied with respect to wind speeds, temperature, visibility, and solar radiation. Ozone measurements were correlated with diurnal meteorological data to serve as an indication of photochemical air pollution. Ozone levels above 100 ppb were recorded.

29427 **APTIC NO. 51157**

Deuber, Arnold and Martin Waibel

EXPERIENCES GAINED THROUGH FIVE YEARS OF DUST FALL MEASUREMENTS IN ZURICH - PART I. *(Erfahrungen aus fuenf Jahren Staubniederschlagsmessung in Zuerich - Teil I). Text in German. Staub, Reinhaltung Luft, 33(5):203-205, May 1973.*

Dust fall measurements taken in Zurich with Bergerhoff units in the period 1966 to 1970 are described. The units were set up on flat roofs 12 to 15 m above the ground level. Each measuring station was equipped with three Bergerhoff units set up 2 m above the roof level. Five measuring stations were located in the city center and five in the suburbs. The highest dust fall was measured at the station located in the industrial section of the city with 3.48 g/sq m/mo followed by a mixed residential and industrial area with 2.96 g/sq m/mo. At the other three stations inside Zurich the concentrations measured were 2.81, 2.40, and 1.95 g/sq m/mo. The water soluble fraction and the acid concentration were higher in the winter months than in summer. The polycyclic hydrocarbons had in winter, double the concentration of the summer. Strangely, the water insoluble fraction was highest in summer.

29428 **APTIC NO. 51423**

Fri, Robert W.

APPROVAL OF PLAN REVISIONS. *Federal Register, 38(99):13561-13562, May 23, 1973.*

The Delaware plan for implementing the national ambient air quality standards was approved, along with the revisions made based on supplemental information submitted by the state. The revison included a change in the date for attaining the national secondary sulfur dioxide standards. The plan was identified and compliance schedules were approved. An amendment to standards for opacity and corrections to certain test methods were also approved. Standards for nitrogen oxides and for acid mists are given.

29429 **APTIC NO. 51432**

Hoschler, Margaret E., E. L. Kanabrocki, Carl E. Moore, and Donald M. Hattori

THE DETERMINATION OF CALCIUM, MAGNESIUM, COPPER, AND IRON AIRBORNE PARTICULATES OVER THE CHICAGO METROPOLITAN AREA. *Appl. Spectry., 27(3):185-188, 1973. 19 refs.*

Samples of air particulates were collected at 21 sampling stations in Chicago and a northern suburb on one day. These samples were analyzed for calcium, magnesium, iron, and copper by atomic absorption spectrometry, and the data collected were compared to similar air pollution studies in other areas. Sampling and analytical methods are described for each of the pollutants. (Author abstract modified)

29430 **APTIC NO. 51502**

Kaji, Hironari, Nobuhiko Nakano, and Kazuo Kimura

STUDIES OF AIR POLLUTION IN THE AREA OF TOKYO. (INTERIM REPORT). *(Tokyo-ken ni okeru taiki osen no chosa kenkyu (chukan hokoku)). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, Inc., Tokyo, p. 87-92, 1973. (Presented at the Society of Automotive Engineers of Japan, Study Meeting, 27th, Tokyo, May 23-24, 1973, Paper 10.)*

Organic compounds in Tokyo were measured by gas chromatography including butane, pentane, hexane, acrolein, benzene, toluene, xylene, trichloroethylene, ethylene, propane, and tetrachloroethylene. Chlorinated hydrocarbon solvents and automobile exhaust gases were detected. High concentrations of acrolein indicatedthe occurrence of photochemical reaction products. Hydrocarbons in a residential area had a lower ratio of low boiling point components containing less than five carbon atoms than the hydrocarbons in an industrial area. Ozone and oxidants were also measured.

29431 **APTIC NO. 51085**

Kemka, R.

FINAL REPORT OF THE INSTITUTE PROJECT NO. U-2. DETERMINATION OF THE CHROMIUM LEVEL IN THE AIR OF THE STATE-OWNED REFINING PLANT IN ZIARA ABOVE HRON, WITH RESPECT TO ITS RECYCLING IN THE PRODUCTION PROCESS. *(Zaverecna zprava ustavneho ukolu c. U-2. Stanovenie hladiny chromu v ovzdusi kyslicnikarne Zavodu SFP v Ziari n/Hronom vzhladom na joho recirkulaciu vo vyrobnom procese). Research Inst. of Industrial Hygiene and Occupational Diseases, Bratislava (Czechoslovakia), Proj. U-2, March 1973. 1 ref. Translated from Czech., 13p.*

The air quality of an aluminum oxide refining plant was measured to determine the content of hexavalent chromium. The processes, raw materials, and product composition were examined. Chromium concentration in the air samples was determined by polarographic methods. The average Cr values were well within the limits of the maximum allowable concentration values, with no tendency toward increasing, except in the dustier parts of the plant.

29432 **APTIC NO. 51512**

Kubota, Kimio, Yasuo Iida, and Kunio Yoshizumi

PRESUMPTIVE CALCULATION OF POLLUTANTS IN CAR EXHAUST GAS IN A SPECIFIED AREA. *(Tokutei chiiki ni okeru jidosha haikigasuchu osen busshitsuryo no suitei keisan). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot., vol. 4:95-98, March 1973. 3 refs.*

The amount of automobile exhaust gases emitted in Tokyo at specific areas was measured. The concentrations of carbon monoxide, hydrocarbons, and nitrogen oxides at Oume road have not changed greatly from 1967 to 1971. At the No. 7 loop road, automobile exhaust increased to twice the 1968 amount due to increased traffic.

29433 **APTIC NO. 51582**

Miller, D. E. and P. Ryder

MEASUREMENT OF THE OZONE CONCENTRATION FROM 55 TO 95 KM AT SUNSET. *Planetary Space Sci., 21(6):963-970, June 1973. 15 refs.*

Ozone concentrations in the mesosphere and lower thermosphere at sunset were measured by the occultation technique from rocket payloads. Two of these were developmental flights made from Woomera, South Australia, in June 1966. Both produced useful results from 55-70 km and one provided information indicating the presence of a secondary ozone layer with approximately uniform concentration between 72-92 km. The design target for the final flight was the detection of ozone down to about (5 times 10 to the 6th molecules/cu cm). The experiment was flown from Fort Churchill, Canada, in Sept. 1969 as part of a roll-stabilized payload containing a photodiode detector and a pair of matched interference filters. The results revealed an ozone minimum near 80 km and a secondary maximum around 90 km. The dependence of ozone on air density is possible. (Author abstract modified)

29434 **APTIC NO. 51587**

Raynor, Gilbert S., Eugene C. Ogden, and Janet V. Hayes

VARIATION IN RAGWEED POLLEN CONCENTRATION TO A HEIGHT OF 108 METERS. *J. Allergy Clin. Immunol., 51(4):199-207, April 1973. 7 refs.*

Ragweed pollen concentrations were measured at five levels within 1.5-108 m to determine concentration variations within the lower atmosphere. Vertical pollen profiles determined great variations from day to day, but when averaged over pollen seasons or longer periods, little systematic change with height was determined. (Author abstract modified)

29435 **APTIC NO. 51166**

Sugimae, Akiyoshi and Toshio Hasegawa

VANADIUM CONCENTRATIONS IN ATMOSPHERE. *Environ. Sci. Technol., 7(5):444-448, May 1973. 13 refs.*

The concentration and particle size distributions of atmospheric vanadium were measured in Osaka. The average concentrations at 11 sampling sites ranged within 0.05-0.55 micrograms/cu m, with an average of 0.16 micrograms/cu m, and were related to the quantities of fuel oil burned in the areas around the sampling sites. Vanadium concentrations were closely correlated with sulfur dioxide concentrations, except on rainy days; the correlation coefficients ranged within 0.79-0.91. Slopes of regression relatinv V concentrations to SO2 concentrations ranged within 2.9-7.7 in units of micrograms/cu m and ppm, respectively. The mass median equivalent diameters of atmospheric V ranged within 0.23-0.76 micron, with an average diameter of 0.46 micron. (Author abstract modified)

29436 **APTIC NO. 51383**

Sugishita, Junichiro

AIR POLLUTION MEASUREMENT IN SCHOOLS. *(Gakko ni oyobosu taiki osen sokutei ni tsuite). Text in Japanese. Tokyo-to Yakuzaishikai-shi (J. Tokyo Met. Assoc. Pharm.), no. 104:25, March 1973.*

An examination of two pollutant concentration distribution maps of Tokyo shows that both sulfur oxide and nitrogen oxide concentrations are clearly higher in the 23 districts of Metropolitan Tokyo compared to municipalities and townships in greater Tokyo. The outlying western districts of the Tokyo Metropolitan area marks a clear borderline for higher concentrations. In greater Tokyo, some schools near much traffic show the characteristics of very low concentrations of SOx and very high concentrations of NOx; at another school near limited traffic, SOx is very high but NOx is markedly low. A sample questionnaire to be given to school children concerning their health conditions is presented. The questionnaire include 15 questions on conscious symptoms, the time and place of occurrences and circumstances, whether they had breakfast or not, whether they slept well on the previous night, whether they had special physical conditions, and usual health condition.

1972

29437 **APTIC NO. 51042**

General Electric Co., Philadelphia, Pa.

INDOOR-OUTDOOR CARBON MONOXIDE POLLUTION STUDY. *Environmental Protection Agency Contract CPA 70-77, Program Element 1H1326, EPA-R4-73-020, 443p., Dec. 1972.*

NTIS: PB 220425

The objective of the study was to gather and analyze a large statistical data base of carbon monoxide, hydrocarbons, particulates, and lead concentrations inside and outside each building at different levels above the roadways and to relate these concentrations to the wind, temperature, and traffic conditions which occurred at each site. The study was designed to obtain sufficient data to determine if a significant difference in the relationships between pollutant levels and environmental parameters was observable between the two sites. It was structured to explore whether or not these pollutant/ environmental relationships changed as a function of building heating and non-heating seasons. Carbon monoxide concentrations were measured with non-dispersive, infrared instruments. Hydrocarbon measurements were made with flame ionization detectors. The data obtained indicates that the pollutant level internal to buildings is greatly influenced by traffic, the height above the traffic, and stack effects internal to the buildings. Guidelines for urban planners are suggested.

29438 **APTIC NO. 51060**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Dept.

RESULTS OF INVESTIGATION (EMERGENCY GENERAL INSPECTION) OF ENVIRONMENTAL POLLUTION BY CADMIUM IN AREAS IN THE VICINITY OF MINES AND REFINERIES, AND ACTIONS TAKEN. *(Kozan, seirensho shuhen chiiki kadomyumu kankyo osen chosa kinkyu sotenken) to no kekka to sochi ni tsuite). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 347-384, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 84p.*

Environmental pollution was investigated in 50 areas containing refineries and mines which are the sources of discarded mercury and cadmium. Cadmium concentrations were measured in rice, paddy soils, drinking water, river and sea water, discharge water, water sediments, agricultural crops other than rice, and fish and shellfish. Mine and refinery sources of cadmium and all measured concentrations are listed. Air quality measurements were made in 12 areas, and 327 samples were examined. The highest value of cadmium concentration observed was 2.594 micrograms/cu m. The highest average values by areas was 0.468 micrograms/cu m. Medical examinations were also carried out for the inhabitants in the areas of study. Health examinations were to determine cadmium concentrations in the body and to detect Itai-itai disease. Research, monitoring, and health examinations would continue in these areas.

29439 **APTIC NO. 51961**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Dept.

RESULTS OF THE SURVEY (URGENT GENERAL CHECK) OF ENVIRONMENTAL POLLUTION BY CADMIUM IN THE ENVIRONS OF MINES AND SMELTING WORKS, AND APPROPRIATE MEASURES. (INTERIM REPORT). *(Kozan seirensho shuhenchiiki kadomyumu kankyo osen chosa (kinkyu sotenken) no kekka to sochi ni tsuite. (chukan hokoku)). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 329-346, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Translation Service, Fujisawa, 39p.*

Environmental pollution was investigated in 32 areas containing factories and mines which are the source of waste mercury and cadmium. Cadmium concentration was measured in rice, paddy soil, drinking water, river and sea water, waste water, river-bed matter, agricultural crops other than rice, fish and shellfish, and air. Mine sources of cadmium, and all measured concentrations are listed. Air quality measurements were made in seven areas, with highest cadmium concentrations being 0.352 micrograms/cu m. Cadmium concentrations exceeded the normal 0.1 micrograms/cu m in five of these areas. Investigations, monitoring, and research should continue. Medical examinations of the inhabitants and determining emission standards are to be developed.

29440 **APTIC NO. 51070**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Dept.

OPINION OF THE WELFARE MINISTRY WITH REGARD TO ENVIRONMENTAL POLLUTION BY CADMIUM IN OMUTA DISTRICT IN FUKUOKA PREFECTURE AND COUNTERMEASURES TO BE TAKEN. *(Fukuoka-ken Omuta chiiki ni okeru kadomyumu kankyo osen ni kansuru koseisho no kenkai to kongo no taisaku). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 283-320, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 60p.*

The policy of the Japanese Ministry of Welfare in regard to environmental pollution by cadmium in the Fukuoka Prefecture is presented. The sources of cadmium in the Omuta area were determined to be the refineries. Cadmium concentrations were determined for air, waste water, river and sea water, river-beds, stack gases, drinking water, unpolished rice and soil, food, and marine products. Air quality measurements at 10 different sites indicated that cadmium concentration varied from 0.3645 2.998 micrograms/ cu m. A medical examination of various inhabitants was also conducted to determine cadmium concentration in the urine. All data were compared with data from other evaluated areas, and the Omuta area was designated for future observation. Control measures suggested included: continuous monitoring of air, water, and crops; continuing health examinations of the inhabitants; and investigating all refineries and mining facilities to determine the type of control method and equipment sufficient to minimize effluents.

29441 **APTIC NO. 51653**

Saitama Prefectural Government (Japan), Dept. of Public Welfare

THE STATE OF AIR POLLUTION IN FY 1971. *(Showa 46-nendo taiki no osen no jokyo ni tsuite). Text in Japanese. Rept. 800, 15p., Oct. 3, 1972.*

Air pollution was measured in 1971 in Saitama Prefecture. Sulfur oxide concentrations exceeded annual average 1-hour values of 0.05 ppm or lower at two stations (of 13). Sulfates and dust fall were higher in the southern part of the Prefecture than the northern. The sulfate concentration was 0.78 mg/100 sq cm/day in the south compared with 0.58 mg/100 sq cm/day in the north. The highest amount of settling dust was 19 tons/sq km/mo in the south. Suspended dust was higher in the south; the highest measurement was 0.11 mg/cu m for average 1-hour value. The average 1-hour value for oxidants was 0.021 ppm to 0.032 ppm. Nitrogen oxides were generally higher than the U. S. standards. Carbon monoxide was also measured.

29442 **APTIC NO. 51570**

Blokzijl, P. J. and R. Guicherit

THE OCCURRENCE OF POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) IN OUTDOOR AIR. *TNO-Nieuws, 27(11):653-660, Nov. 1972. 34 refs.*

The polynuclear aromatic hydrocarbon (PAH) content in the atmosphere of the western part of the Netherlands was measured and compared with the PAH concentration in the air of major European and United States cities. The highest concentrations were measured in November and December, with the lowest values for May-October, indicating domestic heating as the major source rather than automotive exhausts. Based on measurement data, PAH levels have continuously decreased in urban areas. The PAH of greatest concern included pyrene, fluoranthene, 1,2-benzanthracene, chrysene, benzopyrene, benzo(3-4)pyrene, benzoperylene, anthanthrene, and coronene.

29443 **APTIC NO. 51465**

Neustadter, Harold E., Robert B. King, J. Stuart Fordyce, and John C. Burr, Jr.

AIR QUALITY AEROMETRIC DATA FOR THE CITY OF CLEVELAND FROM 1967 TO 1970 FOR SULFUR DIOXIDE, SUSPENDED PARTICULATES, AND NITROGEN DIOXIDE. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Work Unit 770-90, Rept. E-6635, NASA TM X-2496, 54p., March 1972. 3 refs.*

The air sampling program of the Cleveland Air Pollution Control Division is reviewed. Concentrations of sulfur dioxide, suspended particulates, and nitrogen dioxide were measured on a 24-hour basis at various sampling sites within the area. The concentrations of SO2 and suspended particulates correlated closely, suggesting fossil fuel combustion as a common emission source. Complete data on concentrations of the pollutants with respect to geographical position and diurnal, seasonal, and annual variations are tabulated.

29444 **APTIC NO. 51445**

Okawa, Tomio, Hisanori Okuda, Shiro Tsukada, Toshihiko Kamata, and Hiroko Fujimori

DETERMINATION OF DUST DEPOSIT AND SO2 (PBO2 METHOD) IN HIROSHIMA. *(Hiroshima-shi ni okeru koka baijinryo oyobi aryusan gasu sokutei seiseki). Text in Japanese. Hiroshima Daigaku Igaku Zasshi (Med. J. Hiroshima Univ.), 20(10, 11, 12):405-411, 1972. 22 refs.*

Dust deposit and sulfur dioxide were measured by the British Standard Deposit Gauge and the lead dioxide method, respectively, from April 1965 to March 1970 at 13 points in Hiroshima. The monthly average rate of the dust deposit was 7.4 tons/sq km/mo and that of SO2 was 0.3 mg/day/100 sq cm PbO2. The dust deposit was greater from spring to summer. It is presumed that the raining season and the typhoon season cause this phenomena. The SO2 increased slowly in winter. Hiroshima in comparison with other industrial cities had relatively lower air pollution.

29445 **APTIC NO. 51197**

Thomson, Quentin R.

INDOOR VERSUS OUTDOOR AIR POLLUTION. *Biomed. Environ., 11(11/12):22-23, 27, Nov./Dec. 1972. 6 refs.*

In an indoor versus outdoor pollution project conducted in Arizona, more than 200 samples were taken for particulate matter in and outside of commercial buildings, hospitals, laboratories, schools, residences, and automobiles. Over 90% of the time indoor air showed a higher particle count than outdoor air, indicating the inadequacy of most air conditioning systems. Compared to readings in the hundreds of thousands/cu ft for most indoor, habitable spaces, a special laboratory had a particle count of sizes above 0.5 micron of only 570 particles/cu ft. However, such air purity would cost over $5000 for a 10 by 12 ft space. Indoor particle counts appeared to vary with outdoor counts, but a definite correlating factor was not established. The study also showed that particles below 1 micron tend to remain in suspension in indoor air indefinitely and that vacuum cleaner efficiency is lower for fine particles than for particles 1 micron and larger. Indoor sources of generation of fine particles that go into suspension included clothing, furniture, bedding, and cooking.

29446 **APTIC NO. 51447**

Tsuji, Kusuo, Yasuo Suzuki, Masuo Tobe, Masaharu Tonomura, Yasuko Emoto, Masaru Saito, Mikio Araki, and Manabu Muramatsu

STUDIES ON THE SUSPENDED PARTICLES IN INDOOR AIR. II. ON THE POLLUTION OF INDOOR AIR BY METAL COMPONENTS IN SUSPENDED PARTICLES. *(Shitsunai kukichu no fuyu funjin ni kansuru kenkyu (Dainiho): Kinzoku ni yoru shitsunai no osen ni tsuite). Text in Japanese. Eisei Shikensho Hokoku (Bull. Natl. Inst. Hyg. Sci., Tokyo), no. 90:27-32, Nov. 1972. 3 refs.*

Experiments were carried out to determine the amount of metal content of suspended particles in indoor and outdoor air. Two offices and one department store were chosen for the study. The amount of the suspended particles in the indoor air was approximately 1/2 of the outdoor air. The ratio of suspended particles and metal content was approximately 10:1. Most of the metal in suspended particles was zinc in the daytime and iron at night. At the department store, the amount of suspended particles was small, but the ratio of metal content reached 28%. Amounts of lead, nickel, and copper were relatively low, each metal being 0.01-2.0% of total metal content. The metal content of outdoor air affected little on the composition of indoor air. Cadmium, magnesium, manganese, cobalt, and calcium were also measured.

1971

29447 **APTIC NO. 51386**

Tottori Prefectural Public Health Research Lab. (Japan)

INVESTIGATION INTO AIR POLLUTION IN THE STREETS OF CITIES. *(Shigaichi ni okeru taiki osen chosa). Text in Japanese. Tottori-ken Eisei Kenkyusho-ho (Bull. Tottori Prefect. Pub. Health Lab.), no. 11:20-23, Dec. 1971.*

Sulfur dioxide was measured at five places in Tottori city, four places in Kurayoshi, six places in Yonago, and three places in Sakaiminato in Tottori Prefecture for ten months in

1971. The average value of sulfur trioxide measured by the lead dioxide method in Tottori was 0.2 mg/100 sq cm/day, for Kurayoshi 0.1 mg/100 sq cm/day, for Yonago 0.3 mg/100 sq cm/day, and for Sakiminato 0.1 mg/100 sq cm/day. Since 0.5-1.0 SO3 mg/100 sq cm/day is slight pollution, all the areas had very slight pollution.

ATMOSPHERIC INTERACTION

1973

29448 **APTIC NO. 51397**

Kanagawa Prefectural Government (Japan), Pollution Control Bureau

COMPREHENSIVE ANALYSIS RESULTS OF A THREE-DIMENSIONAL SURVEY ON CONCENTRATION DISTRIBUTION BY ALTITUDE OF AIR POLLUTANTS. *(Taiki osenbusshitsu no kodobetsu nodobunpu (Rittai) chosa sogokaiseki kekka). Text in Japanese. Preprint, 2p., May 1973.*

Air pollutants were surveyed by altitude over the Tokyo and Sagami Bays and the entire Kanagawa Prefecture. When a front and sea winds enter the Prefecture, ozone concentration over the entire Prefecture increases. The air pollutants move away from the inland area with northerly winds and return with southerly winds. When a weak southerly wind blows toward the inland area, the O3 over Tokyo and Sagami Bays is lower and that over the inland area is higher. When the ground level oxidant concentration is high, the O3 concentration in the atmosphere at 1000 m altitude is correspondingly high. Sometimes the concentration at 500-1000 m is two to three times higher than at ground level. When the O3 concentration is high, the nitrogen oxide concentration is low and the unsaturated hydrocarbon concentration is high. This is due to photochemical reactions. The air over Sagami Bay and the air over Tokyo Bay are equally polluted.

29449 **APTIC NO. 51521**

Asakino, Kunihiko, Rinko Nagata, Tomio Hirono, and Toshio Odaira

MOVEMENT OF POLLUTANTS IN CLEAN AREAS. *(Seijo chiku ni okeru osen busshitsu no dotai). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 4:35-40, March 1973. 5 refs.*

Diffusion of air pollutants and air pollution levels in Tokyo were studied. Four measurement stations were selected more than 100 km away from large scale pollution sources. Measurements of sulfur dioxide, nitrogen oxides, oxidants, ozone, carbon monoxide, hydrocarbons, and floating dust were conducted from April 1971 to Oct. 1972. Iron, lead, copper, manganese, nickel, cadmium, sulfate, and nitrate were found in suspended dust. The values for each component gave no clear indication whether the concentrations of substances in clean areas are due to natural or anthropogenic sources; for oxidant and sulfur dioxide, a significant trend was found.

29450 **APTIC NO. 51179**

Benarie, M., T. Menard, and A. Nonat

A STUDY OF THE CONVERSION OF SULFUR DIOXIDE INTO SULFURIC ACID IN RELATION TO THE CLIMATIC CONDITIONS IN AN INDUSTRIAL AREA OF ROUEN. *(Etude de la transformation de l anhydride sulfureux en acide sulfurique en relation avec les donnees climatologiques dans un ensemble urbain a caractere industriel, Rouen). Text in French. Atmos. Environ., 7(4):403-421, April 1973. 38 refs. (Presented at the Colloque sur les Atmospheres Polluees, Paris, France, 10th, May 3-5, 1972 and the International Clean Air Conference, Melbourne, Australia, May 15-16, 1972.)*

The atmospheric oxidation of sulfur dioxide to sulfuric acid aerosol was studied during the winter of 1969-1970 at seven sites in the Rouen region. The reaction was governed by the catalytic action of the suspended solid matter. Compared with this effect, the acceleration of the reaction by ammonia was slight and the action of nitrogen dioxide was even less definite. No photochemical action was perceptible. The overall effect of fog was a decrease in the H2SO4 aerosol concentration. The lower limit of estimation of the reaction rate was 6-25%/hr. The mean value for total airborne sulfur in the form of H2SO4 in the wintertime atmosphere of Rouen was 7.1%.

29451 **APTIC NO. 51561**

Brasseur, G. and M. Nicolet

CHEMOSPHERIC PROCESSES OF NITRIC OXIDE IN THE MESOSPHERE AND STRATOSPHERE. *Planetary Space Sci., 21(6):939-961, June 1973. 59 refs.*

The behavior of nitrogen oxides in the stratosphere and mesosphere is discussed with the aid of a model which introduces the photodissociation of nitric oxide and the formation of nitric acid. The profiles of NO, nitrogen dioxide, and HNO3 concentrations are sensitive to the values of the eddy diffusion coefficients which are adopted. Formation of HNO3 in the stratosphere is related to the production of hydroxyl radicals in the lower stratosphere. An increase in the absolute values of HNO3 concentrations is obtained when there is a decrease in those of NO2 and NO concentrations, e.g., an increase of the water vapor in the stratosphere leads to a decrease of NO and NO2. The absolute values of NO in the mesosphere depend on transport conditions from the lower thermosphere; however, there is no downward current of NO at the stratopause level. In the stratosphere, production of NO by an oxidation process of nitrous oxide (and the production of nitrogen atoms by cosmic rays) leads to a downward current of nitrogen oxides through the tropopause. The final sink depends on HNO3 formation related to destruction of water, methane, and hydrogen molecules; while the importance of the sink depends on values of horizontal and vertical eddy diffusion coefficients at and above the tropopause. New data on NOx mixing ratios are needed, particularly if large quantities of NO have been injected into the stratosphere after nuclear explosions.

29452 **APTIC NO. 51213**

Chaudhry, F. H. and R. N. Meroney

A LABORATORY STUDY OF DIFFUSION IN STABLY STRATIFIED FLOW. *Atmos. Environ., 7(4):443-454, April 1973. 20 refs.*

The usefulness of the similarity that exists between the stably stratified atmospheric boundary layer and a wind tunnel boundary layer developing over a cold plate in regard to mass diffusion phenomenon was investigated. Detailed observations of the concentration field downwind of a point source of Krypton-85 were made under different stability conditions in the wind tunnel boundary layer. The concentration characteristics obtained from diffusion experiments showed excellent agreement with those observed in the atmosphere. The index m, describing the power law variation of ground level concentration with distance, matched reliable field estimates. The data compared well with the predictions of Lagrangian similarity theory. It appeared that the parameters evaluated in the field by Klug held also for the wind tunnel data. A comparison of detailed observations with an available numerical solution of the three-dimensional diffusion equation suggested that the detailed diffusion patterns obtained from the wind tunnel experiments would be preferable to numerical solutions requiring arbitrary specification of lateral diffusivity. The theoretical background and experimental techniques used are described. (Author abstract modified)

29453 **APTIC NO. 51260**

Csanady, G. T.

EFFECT OF PLUME RISE ON GROUND LEVEL POLLUTION. *Atmos. Environ., 7(1):1-16, Jan. 1973. 19 refs.*

An elementary theoretical model of ground level concentrations of pollutants emitted by a tall chimney (the effective height model) was constructed by exploiting two features of buoyant plume behavior. For moderate-to-strong winds with low turbulence levels, the model used the 2/3 power law describing mean plume path. For light-to-moderate winds and high turbulence intensity, as under convective conditions, a plume breakup model was used. The model successfully predicted ground level concentrations under neutral and unstable conditions. Additional model parameters included emission rate, atmospheric temperature and pressure, stack and plume height, and heat emission. (Author abstract modified)

29454 **APTIC NO. 51695**

Dietz, Russell N. and Edgar A. Cole

TRACING ATMOSPHERIC POLLUTANTS BY GAS CHROMATOGRAPHIC DETERMINATION OF SULFUR HEXAFLUORIDE. *Environ. Sci. Technol., 7(4):338-342, April 1973. 15 refs.*

Based on a nitric oxide treated molecular sieve column which quantitatively elutes sulfur hexafluoride prior to the components of air, laboratory and portably electron gas capture chromatographic procedures were developed to determine SF6 down to a sensitivity of less than 4 times 10 to the -13th power cu cm/cu cm with preconcentration. The laboratory chromatograph can measure the SF6 concentration in collected air samples at a rate of 1/5 min. Application to plume studies by simultaneous determination of sulfur dioxide, sulfate, and SF6 established that the measured decrease of pollutant concentration was primarily attributable to dilution. The capability of airborne power plant plume crosswind concentration gradient determinations using SF6 as a tracer gas was demonstrated. (Author abstract modified)

29455 **APTIC NO. 51301**

Druilhet, A. and J. Fontan

DETERMINATION OF THE VERTICAL DIFFUSION COEFFICIENTS BETWEEN 0 AND 100 M BY USING RADON AND THB. *(Determination des coefficients de diffusion verticale entre 0 et 100 m a l aide du radon et du ThB). Text in French. Boundary-Layer Meteorol., 3(4):468-498, March 1973. 16 refs.*

The concentrations of radon and thorium B were continuously measured at 1.5, 30, and 100 m and correlated with standard meteorological data (wind and temperature profiles) to determine the vertical diffusion coefficients. The principal computation methods, approximation errors, fields of applicability, and mathematical results are examined. The method was applied to the stationary state and to diurnal variations. Seasonal characteristics in the development of nocturnal inversions were determined. In each layer, 1.5-30 and 30-100 m, the coefficients were lower during the summer period and the values in the layers were clearly different.

29456 **APTIC NO. 51485**

Edinger, James G.

VERTICAL DISTRIBUTION OF PHOTOCHEMICAL SMOG IN LOS ANGELES BASIN. *Environ. Sci. Technol., 7(3):247-252, March 1973. 6 refs. (Presented at the California Institute of Technology, Symposium in Science in the Control of Smog, Pasadena, Calif., Nov. 1971.)*

Oxidant concentrations and temperature were measured by aircraft soundings in the vertical section above the Los Angeles basin to determine the vertical distribution of photochemical smog. In addition to the polluted layer confined beneath the temperature inversion, laminae of pollution were determined within the inversion layer with concentrations of oxidant as high as those in the ground-based smog layer. These layers have as their source the pollution moving up the heated slopes of the mountain ranges peripheral to the basin. Once injected into the inversion, the pollution is no longer subject to convective mixing motions and maintains high concentrations. (Author abstract modified)

29457 **APTIC NO. 51488**

First, Melvin W.

AEROSOLS IN NATURE. *Arch. Internal Med., 131(1):24-32, Jan. 1973. 17 refs.*

The development of aerosols in nature is discussed. The characteristics of aerosols, especially particle size, optical properties, and particle dynamics are reviewed. Particle distribution in the atmosphere is described and reactions in the atmosphere are reviewed. Cloud formation and atmospheric turbidity are considered, and the removal of particles from the atmosphere is reviewed. The particles originate from many sources. Globally, natural particle production mechanisms predominate, but over large urban areas man-made sources produce a major fraction of total airborne particles. Atmospheric particles include nuclei and ions. Within the planetary boundary layer, the atmospheric aerosol contains large numbers of preformed primary particles that were discharged from ground sources. At higher elevations, secondary particles, formed by gas phase reactions between gases and vapors, often with the aid of activation energy from sunlight, predominate. All viable particles in the atmosphere are discharged from the earth. Particles have a relatively brief existence in the lower atmosphere and a longer, though finite, residence time at higher altitudes. None remain airborne permanently; measured concentrations represent a temporary equilibrium between rates of formation and destruction during sampling periods. (Author abstract modified)

29458 **APTIC NO. 51249**

Fitzgerald, J. W. and P. A. Spyers-Duran

CHANGES IN CLOUD NUCLEUS CONCENTRATION AND CLOUD DROPLET SIZE DISTRIBUTION ASSOCIATED WITH POLLUTION FROM ST. LOUIS. *J. Appl. Meteorol., 12(3):511-516, April 1973. 16 refs. (Presented at the Conference on Weather Modification, 3rd National, Rapid City, S. Dak., June 1972.)*

During July and Aug. 1971, measurements were made of cloud condensation nuclei (CCN), supersaturation spectra, and cloud base microstructure upwind and downwind of St. Louis. The supersaturation spectrum of CCN in 19 upwind-downwind pairs of air samples collected at an altitude of approximately 600 m MSL was measured with a thermal diffusion chamber-type cloud nucleus counter. The average downwind increase in the concentration of CCN active at supersaturations of 0.17 and 1.0% was 52 and 94%, respectively. Measurements of the droplet size distribution in small cumulus and stratocumulus clouds on August 27 and 30 revealed that downwind clouds were composed of smaller and more numerous droplets and had a narrower dispersion of droplet sizes than upwind clouds. The observed differences in droplet concentration between upwind and downwind clouds were somewhat greater than the predicted effect of the upwind-downwind differences in CCN spectra. (Author abstract modified)

29459 **APTIC NO. 51430**

Friend, James P., Robert Leifer, and Morris Trichon

ON THE FORMATION OF STRATOSPHERIC AEROSOLS. *J. Atmospheric Sci., 30(3):465-479, April 1973. 42 refs.*

Laboratory observations were made of the formation of Aitken nuclei and large particles in systems of air containing trace quantities of water, sulfur dioxide, ammonia, and ozone, in varying proportions and under varying conditions of radiation with ultraviolet light. These studies yielded information concerning the photooxidation of sulfur dioxide, the mechanism of formation of stratospheric aerosols, and the possible role of trace organic gases in atmospheric nucleation processes. Results of the study indicated that: the quantum yield for the homogenous oxidation of sulfur dioxide with irradiation in the first excited band was less than 1.0 times 10 to the minus 9th power; the addition compounds of ammonia and sulfur dioxide, if they form, are not precursors to the formation of ammonium sulfate in the atmosphere; the Aitken nuclei are formed by oxidation of sulfur dioxide by oxygen atoms with traces of water present; the addition of ammonia to the system of sulfur dioxide with oxygen atoms gives very rapid production of high concentrations of Aitken nuclei and large particles; and that irradiation of air with water vapor and trace organic gases at wavelengths less than 2500 Angstrom produces Aitken nuclei. The proposed chemical mechanism for the formation of stratospheric aerosols based on laboratory experiments is given. The mechanism explains many of the observed characteristics of stratospheric aerosols. Hypothetical considerations showed how large volcanic injections of sulfur dioxide into the stratosphere can produce a long-lived sulfuric acid aerosol which eventually becomes neutralized as ammonia from the troposphere mixes into the atmosphere. (Author abstract)

29460 **APTIC NO. 51506**

Fukuoka, S., M. Udagawa, M. Funashima, M. Ito, T. Odaira, K. Yamakawa, and M. Muraoka

CHARACTERISTICS OF THE TOKYO PHOTOCHEMICAL SMOG FROM THE VIEWPOINT OF WEATHER. *(Tenkobetsu ni mita Tokyo kokagaku sumoggu no tokucho ni tsuite). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept., Tokyo Met. Res. Inst. Environ. Prot., vol. 4:66-77, March 1973. 2 refs.*

Tokyo photochemical smog is discussed with reference to sunlight, weather conditions, and reaction mechanisms. Oxidants and meteorological factors were measured at 37 stations in and around Tokyo from June to Aug. 1971. Oxidants were high with medium weather conditions and clear or cloudy skys; thus, a medium day accelerates photochemical reactions. The oxidant concentration peaked from 12 to 1 pm; on fine days the peak was earlier. The oxidant concentration tended to increase with a slightly harder wind of 3 to 5 m/sec, especially on a fine or medium day.

29461 **APTIC NO. 51498**

Gamou, Minoru

THE THICKNESS OF THE AIR BOUNDARY LAYER. *(Taiki kyokaiso no atsusa). Text in Japanese. (Kogai Hakua Shobo (Pollution Control), 18(2):115-123, March 1973. 23 refs.*

The air boundary layer is subject to the influence of friction from the ground. The turbulence and diffusion behavior at 1000-2000 m from the upper layer of the constant flux air boundary layer are discussed. The thickness of the air boundary layer can be obtained by the turbulent energy balance and a kinetic equation; however this method has no experimental background and there is no way of defining thickness on the basis of experimental facts. Therefore, experiments have been conducted with a tower, balloon, and airplane to determine constants and parameters for several simulations.

29462 **APTIC NO. 51690**

Garland, J. A., W. S. Clough, and D. Fowler

DEPOSITION OF SULPHUR DIOXIDE ON GRASS. *Nature (London), 242(5395):256-257, March 23, 1973. 7 refs.*

The dry deposition of sulfur dioxide on grass was measured. In the first method, the variation of concentration of SO2 with height was measured. The model also incorporated parameters on eddy diffusion and deposition velocity. The second method involved measurements of SO2 released from a height of 1 m at a position 100 m upwind of the sampling section. The flux of SO2 to the crop was determined, and the deposition velocity was calculated. Wind speed profile was used to determine the roughness length and friction velocity.

29463 **APTIC NO. 51235**

Georgievsky, Yu. S. and G. V. Rosenberg

HUMIDITY AS A FACTOR OF AEROSOL VARIABILITY. *(Vlazhnost kak faktor izmenchivosti aerozolya). Text in Russian. Izv. Akad. Nauk SSR, Fiz. Atmosfery i Okeana, 9(2):126-137, Feb. 1973. 40 refs.*

Based on the data from systematic studies of the influence of humidity on spectral dependencies of the scattering coefficiencies, the role of condensation processes in the transformation of atmospheric aerosol was considered. It was shown experimentally that in the natural conditions the condensation process is optically felt at a relative humidity of r equals 0.2 divided by 0.3, and increases monotonically with the growth of r. The character of this process can be determined by the instantaneous state of condensation nuclei whose random variability is essentially non-stationary. The absolute humidity did not show direct influence on this process.

29464 **APTIC NO. 51579**

Hales, Jeremy M., Marvin A. Wolf, and M. Terry Dana

A LINEAR MODEL FOR PREDICTING THE WASHOUT OF POLLUTANT GASES FROM INDUSTRIAL PLUMES. *Am. Inst. Chem. Engrs. J., 19(2):292-297, March 1973. 11 refs.*

A simplified method for predicting the washout of gaseous constituents from industrial plumes was developed based on the application of the conventional mass transfer theory in conjunction with existing plume dispersion models to account for the reversibility of the adsorption process and liquid-phase mass transfer resistance. The model parameters included drop radius, liquid content, plume release height, rainfall rate, wind velocity, and diffusivity of the pollutant.

29465 **APTIC NO. 51259**

Heines, T. S. and L. K. Peters

THE EFFECT OF A HORIZONTAL IMPERVIOUS LAYER CAUSED BY A TEMPERATURE INVERSION ALOFT ON THE DISPERSION OF POLLUTANTS IN THE ATMOSPHERE. *Atmos. Environ., 7(1):39-48, Jan. 1973. 7 refs.*

The effect of a temperature inversion above the effective stack height on dispersion was studied for continuously emitting infinite line and point source configurations under the condition of constant wind velocity. The conservation of mass equation was solved by the method of Laplace transforms, handling the emission source as finite with ultimate approach to zero size. Groundline concentrations under these conditions were always greater than those during a non-inversion period. The effect of the inversion became negligible when the effective stack height was less than 0.6 times the height of the inversion. (Author abstract modified)

29466 **APTIC NO. 51318**

Hodge, P. W. and Nels Laulainen

TRANSPARENCY AND TURBIDITY OF THE ATMOSPHERE. *(Transparenz und Truebung der Atmosphaere). Text in German. Umschau (Frankfurt), 73(11):325-331, 1973. 25 refs.*

Although aerosols are primarily of natural origin, 5-45% of the particles are due to man s activities. Several methods are described to determine the rate of aerosols. Astronomers and observatories throughout the world are studying atmospheric transparency. The methods used for determining the background level of aerosols include systematic observations of the sky brightness and of the direct solar radiation, as well as extinction measurements. In the U. S. 43 stations measure the aerosol concentration of the atmosphere with Volz solar photometers three times per day. In Europe a similar network exists. It comprises 30 stations which supply photometric data of the solar radiation and 12 stations supplying pyrheliometric data. At the U. S. observatory on Kitt Peak, measurements within the period 1957 to 1969 revealed that the horizontal ground-level visibility decreased because of industrial pollution there was a temporary relief during a 9-month strike of copper smelters. Measurements in Berkeley, California in the first 6 months of 1972 revealed a weakly seasonal variation of the aerosol concentration with an extinction maximum in winter which contradicts most other observations. More extensive measurements will check this result.

29467 **APTIC NO. 51159**

Kerin, Zarka

LEAD IN NEW-FALLEN SNOW NEAR A LEAD SMELTER. *Arch. Environ. Health, 26(5):256-259, May 1973. 6 refs.*

Samples of new-fallen snow were taken within three zones situated at increasing distances in different directions from two centrally located stacks of a lead mine and smelter in the mountainous area of Yugoslavia. The samples were analyzed for their lead content, a factor of the quantities of lead in air through which precipitation of moisture has occurred. Sampling sites and methods are described. The results confirmed the expectation that, with increasing distance from the source of lead emissions, the snow contained consistently decreasing quantities of lead. Samples of new-fallen snow collected at altitudes that differed from that of the stacks yielded results that deviated from each other to such an extent as to alter significantly the negative correlation of the results with an increasing distance of the sampling sites from the stacks. The topography of the area is considered, and lead concentrations for all samples from all the areas are presented. (Author abstract modified)

29468 **APTIC NO. 51583**

Kessler, Edwin

ON THE ARTIFICIAL INCREASE OF PRECIPITATION. *Weather (London), 28(5):188-194, May 1973. 5 refs. (Presented at the Oklahoma Disaster Preparedness Conference, Weather Modification Symposium, Oklahoma City, Nov. 9, 1972.)*

Air cools as it rises and expands, or while it is in contact with a cold surface. Cloud forms in rising air while fog is the condensate formed by contact with a cold surface. Usually clouds and fogs have very small droplets and do not produce important precipitation. Warm seeding (e.g., ammonium nitrate and urea) may stimulate tiny cloud particles to combine into larger particles which can reach ground as rain or snow. Cloud seeding with freezing nuclei (e.g., solid carbon dioxide and silver iodide) stimulates the freezing process which can warm a cloud and thereby produce more vertical growth along with additional condensation. However, the effect of cloud changes on the amount of precipitation reaching the ground is uncertain. Winter weather experiments in the West indicate that the magnitude of seasonal snow and rain increases may be near 10%, but summer experiments were inconclusive with respect to the effect of seeding on total rainfall. Even if rain from individual showers and thunderstorms can be increased in special cases, questions of cost vs. benefits, long-term effects on land use, possible rain changes outside of the target area, and the potential triggering of unwanted severe storms or floods have not been well considered.

29469 **APTIC NO. 51422**

Khrgian, A. Kh., V. M. Berezin, N. F. Yelansky, V. A. Yiozenas, and V. A. Krasnopolsky

SOME RESULTS OF SATELLITE OZONE OBSERVATIONS ON 17-18 JUNE, 1966. *(Nekotorye rezul taty nablyudeniya ozona so snutnika 17-18 iyunya 1966 g). Text in Russian. Meteorol. i Gidrol., no. 4:3-12, April 1973. 9 refs.*

The distribution of the total amount of ozone observed from a satellite on June 17-18, 1966 between 20 deg South and 60 deg North latitude is considered, and the influence of continents on it is described. The position of cyclones, fronts, and jet currents resulting in the formation of narrow protruded areas of high amounts of ozone to the left of the axis of the current are also described, as well as the areas of low amounts of ozone to the right of the axis. Two belts of ozone minima were observed in the tropical zone. They were related to the north and south branches of the intratropical convergence zone, divided by a small well traced ozone ridge.

29470 **APTIC NO. 51451**

Lamb, Robert G. and John H. Seinfeld

MATHEMATICAL MODELING OF URBAN AIR POLLUTION. GENERAL THEORY. *Environ. Sci. Technol., 7(3):253-261, March 1973. 19 refs. (Presented at the Symposium on Science in the Control of Smog, California Institute of Technology, Pasadena, Calif., Nov. 1971.)*

A fundamental general theory of urban air pollution is developed. A number of points considered in the theory include: the definition of the mean and random components of the wind velocity field, the necessary conditions for obtaining conventional Eulerian and Lagrangian models, the proper inclusion of nonlinear chemical reactions in a model, the nature of the spatial and temporal averages implicit in the computed concentrations, and the requirements for simulating photochemical smog formation in an urban area. (Author abstract)

29471 **APTIC NO. 51532**

Lindzen, Richard S. and Douglas L. Will

AN ANALYTIC FORMULA FOR HEATING DUE TO OZONE ABSORPTION. *J. Atmospheric Sci., 30(3):513-515, April 1973. 4 refs.*

An analytic formula for heating due to ozone absorption in the troposphere is discussed. Ozone absorption is described, and a mathematical formula for the process is given. Ozone heating can be accurately modelled by two Chapman layers plus a modified Chapman layer for the Huggins bands.

29472 **APTIC NO. 51285**

Loon, J. C. Van

TORONTO S PRECIPITATION ANALYZED FOR HEAVY METAL CONTENT. *Water Pollution Control (Toronto), 111(2):38-41, Feb. 1973. 10 refs.*

Precipitation was analyzed for sodium, magnesium, lead, cadmium, zinc, iron, calcium, potassium, chlorine, sulfate, and pH to determine its air cleaning effect. With the exception of lead and pH, the average level of the chemical constituents studied were well below the Canadian drinking water standards. The long term concentration of some of the more harmful materials in exposed soils and on buildings and other surfaces undoubtedly presents a problem. The intensity of pollutant concentration in precipitation correlated well with urban and industrial concentration. A significant reduction in the magnitude of these levels should occur with the installation of emission control devices on stacks and motorized vehicles. The most notable differences in the averages of materials in snow and rain was the much higher sodium value of snow. This is due to road salting in the winter. Samples taken at the ground level had larger sodium values (5 ppm) but even those collected at heights of 30 ft (3 ppm) contained much more sodium than average rain (0.2 ppm). No obvious correlation could be demonstrated between ground level wind direction and contaminents in rain.

29473 **APTIC NO. 51169**

Martin, A. and F. R. Barber

FURTHER MEASUREMENTS AROUND MODERN POWER STATION -- I-III. *Atmos. Environ., 7(1):17-37, Jan. 1973. 14 refs.*

Ground level concentrations of sulfur dioxide were measured around two power plants to determine short and long-term values in a variety of atmospheric conditions. The single and combined effects of emissions from the two stations were small, typically only 10% of the background level over a season. The measured concentrations and their duration were less than the levels determined as harmful to plants. Direct and indirect measurements of plume behavior were also studied. Laser studies determined that the plumes were fragmentary in nature. Substantial pulses of SO2 were recorded at 42 m but on some occasions were considerably attenuated at 6 m. The data were correlated with wind speed and stability data. Peak SO2 concentrations were predicted based on the field data of ground level concentrations, concentrations on an elevated open structure, and ground level concentrations under elevated stable layers. The empirical relationships predicted concentrations with a factor of two about the measured concentrations. Deviations from the predicted concentrations were explained by the observed plume behavior. (Author abstract modified)

29474 **APTIC NO. 51438**

Montgomery, T. L., W. B. Norris, F. W. Thomas, and S. B. Carpenter

A SIMPLIFIED TECHNIQUE USED TO EVALUATE ATMOSPHERIC DISPERSION OF EMISSIONS FROM LARGE POWER PLANTS. *J. Air Pollution Control Assoc., 23(5):388-394, May 1973. 8 refs.*

A simplified method which is used by the Tennessee Valley Authority to estimate ambient concentrations of atmospheric emissions from power plants is described. The technique requires the use of three nomograms for the graphic solution of three dispersion models -- coning, inversion breakup, and trapping. A discussion of the meteorological conditions that are associated with the dispersion models, supporting appendices, and an example are also presented. (Author abstract)

29475 **APTIC NO. 51687**

Mueller, Frank X., Leopald Loeb, and William H. Mapes

DECOMPOSITION RATES OF OZONE IN LIVING AREAS. *Environ. Sci. Technol., 7(4):342-346, April 1973. 11 refs.*

The decomposition rate of ozone was monitored in several metal test facilities, an office, and a home. The decomposition of O3 in living areas followed first-order kinetics. The rate of O3 decay was very sensitive to variations in temperature, relative humidity, prior exposure of metal surfaces, and the number of potentially active catalytic surfaces in the room. Decay rates in closed areas increased with increased temperature or relative humidity. Activated charcoal was effective as a decomposition filter. (Author abstract modified)

29476 **APTIC NO. 51514**

Odaira, Toshio

PROBLEMS OF THE AIR POLLUTION STUDY AND OUTLINE OF THE STUDIES. *(Taiki osen kenkyuno mondaiten to kenkyu no gaiyo). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 4:3-17, March 1973. 24 refs.*

Photochemical smog, pollutant measurement methods, bad odors, and automobile exhaust control studies are discussed. Photochemical reactions produce ozone, nitrogen dioxide, peroxyacetyl nitrate, aldehyde, nitric acid mist, and sulfuric acid mist. The relationship of oxidant to photochemical reaction is discussed. Methods for measuring acrolein, sulfur dioxide, carbon monoxide, phenol, pyridine, methyl acetate, ethyl acetate, butyl acetate, methyl mercaptan, styrene, ethylene, chlorpicrin, and bisulfide are mentioned.

29477 **APTIC NO. 51520**

Odaira, T., K. Asakino, S. Fukuoka, M. Udagawa, T. Izumikawa, M. Funashima, S. Ito, H. Yokota, T. Yamamoto, K. Nishida, O. Ohashi, and T. Arai

ESTIMATION OF CAR EXHAUST GAS CONCENTRATION IN AND AROUND A SIDEWALK BY A WIND TUNNEL EXPERIMENT. *(Fudo jikken ni yoru gairo shuhen no jidosha haikigasu no nodo yosoku ni tsuite). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 4:18-34, March 1973. 16 refs.*

Two wind tunnels were mounted on simulated highway crossings to measure the distribution of tracer gas concentrations on the ground. Smoke produced from hydrochloric acid and ammonia gases was discharged into the tunnels to observe pollutant diffusion, disturbances of air currents due to buildings, and the movement of smoke in a turbulent flow layer. Ethane was used as the tracer gas; it was analyzed in a flame ionization detector and an infrared spectrometer. Wind velocity was 1.0-3.0 m/sec. Forty-eight l/min of tracer gas was discharged. The ethane concentration was 3800-4400 ppm. The estimation of pollutant diffusion by wind tunnels was more effective than by other methods, but was still not equal to actually measured values.

29478 **APTIC NO. 51214**

Riccio, John J.

THE FALLACY OF HYDROCARBON CONTROLS AT STATIONARY SOURCES. *Am. Paint J., 57(46):46-48, 50, 60-64, April 30, 1973. 18 refs.*

Studies of photochemical reactions which produce oxidants in the atmosphere refute the concept of controlling hydrocarbons to meet EPA oxidant standards. Evidence is presented that the ratios of nitrogen oxides to hydrocarbons, the reactivity of hydrocarbons, the duration and intensity of sunlight, emissions from automobile exhausts, flux from adjoining regions, and local concentrations of hydrocarbons have not been taken into consideration when determining the oxidant standards. An attempt is made to demonstrate that restrictions on industrial surface coatings will not lower oxidant levels. Solvent consumption by the paint industry is listed, and it is suggested that chemical reactions in the atmosphere be studied before standards are determined.

29479 **APTIC NO. 51192**

Seguin, B.

ROUGHNESS OF THE COUNTRYSIDE AND ATMOSPHERIC DIFFUSION: A THEORETICAL STUDY DERIVED FROM SUTTON S EQUATIONS. *(Rugosite du paysage et diffusion atmospherique: Etude theorique a partir des equations de Sutton). Text in French. Atmos. Environ., 7(4):429-442, 1973. 24 refs.*

Treebelts used as windbreaks may modify the process of atmospheric diffusion and thus the conditions of localization and intensity of the deposition of pollutants emitted to the atmosphere. This action can be strictly local in the case of a single windbreak, or extended to a regional scale by using networks of windbreaks, which create new roughness elements in the landscape. The consequences of modification of land surface roughness were studied theoretically, with the analysis simplied by assuming that the concerned land surface was homogeneous to a sufficiently large extent, both upwind and downwind of the emission source, and the adoption of near neutral atmospheric stability conditions. The high regional roughness so created tends to increase the turbulent transfer of momentum and, therefore, the dispersive power of the atmosphere. The resulting effect was quantified by both the eddy diffusivity method and the statistical theory method. The results are in a good agreement for a common case (continuous cross-wind, infinite line sources at ground level).

29480 **APTIC NO. 51677**

Su, F. Y.

RADIATIVE SLIP BETWEEN TWO ADJACENT ABSORBING-EMITTING GASES AND ITS APPLICATION TO AIR POLLUTION. *J. Atmospheric Sci., 30(2):317-320, March 1973. 10 refs.*

It was suggested that discontinuities in the lapse rate of temperature may be physically realistic in a radiative model for studies of air pollution effects in the atmosphere. It was demonstrated that not only a discontinuity in lapse rate, but also a temperature jump, is possible, provided that the atmosphere consists of layers with different radiative properties and radiative transfer is the only heat transfer mode considered. A slip boundary condition between two adjacent absorbing-emitting gases was derived. Some aspects of this slip boundary condition for a non-gray gas are discussed. A simple gray gas urban air pollution model was constructed and a weak inversion at the upper boundary of the polluted layer was demonstrated through the use of the slip boundary condition. (Author abstract)

1972

29481 **APTIC NO. 51671**

Japan Environmental Agency, Photochemical Air Pollution Research Committee

REPORT ON RESEARCH USING A MOVEABLE PHOTOCHEMICAL SMOG CHAMBER. *(Idoyo kokagaku sumoggu chamuba ni yoru chosa hokokusho). Text in Japanese. 182p., Dec. 1972. 21 refs.*

Photochemical smog was studied in five areas of Tokyo Bay using a moveable smog chamber from July to Oct. 1972. Air was collected and radiated in the chamber with ultraviolet light. In all areas the ozone concentration increased. In the least polluted area, the initial nitrogen oxide (especially nitric oxide) and hydrocarbon concentrations were low; the yield of ozone formation was also low. In an area polluted by smoke and soot from factories, the NOx and HC concentrations were relatively high; the ozone concentration reached above 0.15 ppm after 1 hr irradiation. In areas polluted by automobile exhausts and by both automobile and factory emissions, the maximum ozone concentration differed depending on initial NOx and HC concentrations. The formation of photochemical oxidants and ozone, therefore, were affected by both NOx and HC. The relationship between these substances was similar to that found in Los Angeles. However, about 10 times more HC was necessary in Tokyo to produce the same maximum concentration of ozone as in Los Angeles. The initial concentration of NOX governs the maximum ozone concentration; the HC concentration controls the ozone formation rate. Olefins were the most active HC for photochemical reactions, aromatic hydrocarbons except benzene were next in activity, followed by paraffins higher than hexane. Benzene and low paraffins seemed to be inactive.

29482 **APTIC NO. 51448**

Davis, D. R. and C. E. Dean

METEOROLOGICAL ASPECTS OF ATMOSPHERIC OZONE AS A POTENTIAL THREAT TO THE FOREST INDUSTRY OF NORTH FLORIDA. *J. Environ. Quality, 1(4):438-441, Oct.-Dec. 1972. 23 refs.*

The presence of atmospheric ozone was observed, and the effects of meteorological aspects on ozone were studied. Observations over the past 8 years showed diurnal, daily, seasonal, and yearly variations in ozone levels. Ozone concentrations were highest in the late winter, spring, and early summer, and lowest in late summer. Day-to-day variations were associated with changes in weather patterns. Minor increases accompanied some, but not all, thunderstorms and cold frontal passage. Major increases were observed with squall lines, ozone-rich air masses, and with stagnating air masses containing air pollutants. Highest observed ozone concentrations were compared with reported damaging threshold concentrations for pine and other commercially important trees. (Author abstract modified)

29483 **APTIC NO. 51567**

Granat, Lennart

ON THE RELATION BETWEEN PH AND THE CHEMICAL COMPOSITION IN ATMOSPHERIC PRECIPITATION. *Tellus (Uppsala), 24(6):550-560, Dec. 1972. 10 refs.*

Based on chemical analyses of about 2000 rainwater samples, the relation between the pH and the total amount of acid or base in the samples was studied with respect to concentrations of sulfate, nitrate, chloride, ammonium, sodium, potassium, magnesium, calcium, and carbonate ions. The contents of metallic trace elements were also determined. The theoretical relation between pH and total amount of acid was calculated and a regular deviation was determined between the empirically measured and theoretically calculated relation. A model was also constructed to predict the amount of acid and was in good agreement with actual data. (Author abstract modified)

29484 **APTIC NO. 51267**

Gurvich, A. S. and V. V. Pokasov

THE SPECTRUM OF FLUCTUATIONS OF LASER RADIATION IN A TURBULENT ATMOSPHERE DURING RAIN. *Bull. Acad. Sci. USSR Phys Atmos. Oceans. (English translation from Russian of: Izv. Akad, Nauk SSR, Fiz. Atmosfery i Okeana), 8(8):506-507, Aug. 1972. 4 refs.*

Measurements of the frequency spectra of light intensity fluctuations when a direct beam of 0.63 millimicron laser light is viewed over a path 1750 m in length during a light drizzle are presented. The measured intensity fluctuation spectra before the rain are shown. The spectral density of the turbulent intensity fluctuations becomes comparable to the shot noise of the photomultiplier. At present, there is no reasonably rigorous theory for the description of intensity fluctuation spectra in the presence of turbulence and aerosols in the atmosphere. Certain estimates of the characteristic frequencies in the spectrum can be based on the assumption of single scattering only. At the low aerosol attenuation observed, the single-scattering approximation appears to be sound for observations in the direct beam, for rough, preliminary estimates.

29485 **APTIC NO. 51221**

Horita, Yasuo

AN INTRODUCTION TO POLLUTION AND BIOLOGY. (NO. 1). *(Kogai seibutsugaku nyumon). Text in Japanese. Kagaku to Yakugaku no Kyoshitsu (Chem. Pharm., Quart. J.), no. 34:15-21, 1972.*

The collaboration of social sciences, humanities, and natural sciences is necessary for the final control of sources of pollution; in every field, a high level of knowledge of pollution and research is required. Biological studies of pollution is one area. The atmospheric strata and constituent gases are discussed. One pollutant in the atmosphere is jet exhaust, which contains water, carbon monoxide, carbon dioxide, nitric oxide, nitrogen dioxide, sulfur dioxide, and hydrocarbons. Photochemical reactions of these elements and reduction to ozone by vapor may create new types of meteorological conditions through the earth surface temperature, rain quantity, and light wavelengths. Monitoring of these elements is important from the ecological point of view. Clouds and meteorological factors are important factors in the dispersion of pollutants.

29486 **APTIC NO. 51043**

Huff, F. A. and S. A. Changnon, Jr.

INADVERTENT PRECIPITATION MODIFICATION BY MAJOR URBAN AREAS. *Preprint, American Meteorological Society, Boston, Mass., p. 73-78, 1972. 4 refs. (Presented at the Conference on Weather Modification, 3rd, Rapid City, S. Dak., June 26-29, 1972.)*

Urban effects on precipitation in and around major U. S. cities, including St. Louis, Chicago, Cleveland, Indianapolis, Washington, D. C., Houston, New Orleans, and Tulsa, were analyzed. Daily and seasonal precipitation distributions, frequency of heavy rainstorms, and hail and thunder-day occurrences were tabulated. In general, relatively strong evidence of urban effects was determined in the daily and/or seasonal precipitation distributions for St. Louis, Chicago, Cleveland, and Washington, D. C. Evidence was weak or nonexistant at Indianapolis, Urbana, Tulsa, and New Orleans. Urban effects in Houston could be identified only in May-September rainfall of air mass origin. The urban effect was more pronounced in the summer than in winter and was usually maximized 10-35 mi downwind of the central city. Effects within the cities were identified at Chicago, Washington, D. C., Houston, and New Orleans. Thunder and hail-day frequency increases were established in the six largest cities and were greatest in the warm season, generally the summer.

29487 **APTIC NO. 51426**

Inoue, Kentaro

RELATIONSHIP BETWEEN SULFUR DIOXIDE CONCENTRATION IN MIZUSHIMA INDUSTRIAL AREA. PART 2. COMPARISON OF SULFUR DIOXIDE CONCENTRATION MEASURED PRACTICALLY AND LOGICAL CONCENTRATION CALCULATED USING PASQUILL S CHART. *(Mizushima Rinkai kogyo chitai ni okeru taiki osen to kisho joken ni tsuite. 2. Oto rekoda de jissokusareta aryusan gasu nodo to riron kakusan keisanchi to no kankei ni tsuite). Text in Japanese. Okayama Igakai Zasshi (J. Okayama Md. Soc.), 84(7):201-207, Aug. 8, 1972. 5 refs.*

The logical concentration of sulfur dioxide was calculated using Pasquills chart in 15 principal chimneys in Mizushima industrial area which emitted 74% of the SO2 over Mizushima. The results were compared with concentrations measured practically at the station of Fukuda-cho, Mizushima harbor office and Amagi. The high concentrations of SO2 measured at Fukuda-cho station could be logically explained by the diffusion called C-stability following Pasquill, and those at Amagi station could be also explained by the diffusion called D-stability.

29488 **APTIC NO. 51098**

Kuhn, Michael

THE SPECTRAL TRANSPARENCY OF THE ANTARCTIC ATMOSPHERE. PART II: RESULTS AND ANALYSIS. *(Die spektrale Transparenz der antarktischen Atmosphaere. Teil II: Messergebnisse und Analyse). Meteorol. Geophys. Bioklimatol., Ser. B, vol. 20:299-344, 1972. 55 refs. Translated from German, 61p.*

The aerosol extinction coefficients were determined from measurements of intensities of direct solar radiation in the Antarctic. Atmospheric parameters were studied with respect to air circulation, turbidity, the particle size spectrum, condensation, ozone absorption, and precipitation. Meteorological data also included pressure, temperature, wind velocity, cloud cover, inversions, and their daily and seasonal variations.

29489 **APTIC NO. 51244**

Larson, R. E., R. A. Lamontagne, P. E. Wilkniss, and W. I. Wittmann

RADON-222, CO, CH4 AND CONTINENTAL DUST OVER THE GREENLAND AND NORWEGIAN SEAS. *Nature (London), 240(5380):345-346, Dec. 8, 1972. 9 refs.*

Measurements of radon-222, carbon monoxide, methane, and continental dust in air over the open Norwegian and Greenland seas and in the ice covered Greenland sea during August 1971 are reported. The relationships between these parameters and air mass trajectories were investigated. Both dust samples collected over the Greenland sea were of continental origin. The composition was determined by neutron activation analysis and was similar to crystal rock. The agreement between continental dust and radon shows that in remote ocean areas radon is a good tracer for continental air masses. The relationship between radon and dust is very complex because radon concentration depends on the origin of the air mass and the transit time, while the dust concentration can be greatly reduced by precipitation scavenging in rain or fog.

29490 **APTIC NO. 51443**

Mani, Anna and B. B. Huddar

STUDIES OF SURFACE AEROSOLS AND THEIR EFFECTS ON ATMOSPHERIC ELECTRIC PARAMETERS. *Pure Appl. Geophys. (Basel), 100(8):154-166, 1972. 13 refs.*

The dust and nuclei content of the air near the ground was measured to study the characteristic elements of natural pollution at ground level, its origin, and its variation with time, seasons, and altitude. The electric field strength, positive and negative polar conductivities of the air, and the number of positively and negatively charged small ions in the ground level atmosphere were also measured. The dust content and electric field measurement results varied with respect to seasonal and diurnal values opposite to the data on ion density and electrical conductivity. The electric field was at a maximum in winter; the conductivity and small ion content were at a maximum during the monsoon months; and the dust content was at a maximum in the summer premonsoon months. (Author summary modified)

29491 **APTIC NO. 51039**

McClintock, Michael, Alden McLellan, and Leaf Turner

RESEARCH ON THE OPTICAL STATE OF THE ATMOSPHERE. *Wisconsin Univ., Madison, Space and Engineering Center, Environmental Protection Agency Contract 68-02-0337, EPA-R3-72-027, 59p., Nov. 30, 1972. 84 refs.*

NTIS: PB 220394

The possibility of climatic change from the radiative interference from dust and clouds in the atmosphere was investigated. An example of satellite detection of large-scale atmospheric pollution and a laboratory experiment on the non-Lambertian radiative reflection properties of urban areas are provided. A theoretical treatment of electromagnetic scattering from randomly oriented anisotropic particles with the intent of obtaining information about their shape is presented. A change in cloud cover is between 30 and 130 times more effective (depending on cloud height and type) in causing a change in surface temperature than a change in dustiness by modification of the radiative transfer. For further study of atmospheric pollution from satellite data, an investigation of the optical properties of the optical properties of various earth surfaces should be undertaken. The calculations of Stokes matrices for ensembles of randomly oriented anisotropic particles are presented using the Rayleigh-Gans-Born approximation.

29492 **APTIC NO. 51442**

Misaki, M., M. Ohtagaki, and I. Kanazawa

MOBILITY SPECTROMETRY OF THE ATMOSPHERIC IONS IN RELATION TO ATMOSPHERIC POLLUTION. *Pure Appl. Geophys. (Basel), 100(8):133-145, 1972. 10 refs.*

The dynamic spectra of the atmospheric ions with mobilities between 0.00032-0.00000013 sq m/(V sec) were studied in the clean and polluted atmospheres to determine the size spectra of the submicron aerosols. The distribution function in Junge s expression increased in proportion to the radius of the particle. The atmospheric content of submicron aerosols, measured at a rural site, increased greatly, doubling every three years since 1964. (Author summary modified)

29493 **APTIC NO. 51332**

Olds, F. C.

COOLING TOWERS. *Power Eng., 76(12):30-37, Dec. 1972.*

The role of cooling towers in the dissipation of energy on the grand scale is discussed; the complexity which cooling towers add to the task of generating electricity is considered; and tower selection, design, and operation are examined. It is estimated that by 1980 most of the inland waters suitable for condenser cooling will be used, committed or precluded from further use by law. At that time, some 70% of waste heat disposal from power plants will be with closed or combination systems, while 30% could be handled with once-through sea water systems. Charts are presented which show condenser cooling systems planned for turbine generators 300 Mw and larger on which construction has been started or will start within two years. Typical plant cooling systems are described, and installation and operating costs are discussed. Tower design is reviewed in relation to the problems of plume sinking, rainfall, and other meteorological phenomena. The wet-dry tower and dry cooling are described, and the advantages of both are discussed.

29494 **APTIC NO. 51331**

Olesen, K. A. and R. J. Budenholzer

ECONOMICS OF WET/DRY COOLING TOWER SHOW PROMISE. *Elec. World, 178(12):32-34, Dec. 15, 1972.*

The wet/dry cooling tower system is discussed. The operating system is described, and various problems including site limitations, plume abatement, reducing plume severity, and water consumption are reviewed. Costs are analyzed for plume abatement and water conservation, and compared to those of conventional cooling towers. Various designs for differen types of towers and their advantages are discussed.

29495 **APTIC NO. 51209**

Parmele, L. H., E. R. Lemon, and A. W. Taylor

MICROMETEOROLOGICAL MEASUREMENT OF PESTICIDE VAPOR FLUX FROM BARE SOIL AND CORN UNDER FIELD CONDITIONS. *Water, Air,Soil Pollut., 1(4):433-451, Sept. 1972. 19 refs.*

The evapotranspiration of dieldrin and heptachlor vapor from a treated watershed was studied. Data were collected on the pesticide vapor content of the air above the surface of the soil and the crop, wind profiles, temperature, humidity, vapor and atmospheric pressure, net radiation, and stability. Vertical pesticide flux rates were computed on the basis of micrometeorological estimates. Total daily pesticide flux was calculated by summing the total estimated flux for each of the 2 or 4-hour observations. Based on within-canopy pesticide flux profiles and evapotranspiration flux rates, the pesticide flux rate during night was established at zero. No Major sources or sinks for pesticide within the crop were determined; the pesticide vapor flux, therefore, was established as coming directly from the soil. (Author abstract modified)

29496 **APTIC NO. 51565**

Sakagami, Jiro, Fusako Shimazu, and Giichi Iwata

CONCENTRATION OF SUSPENDED DUSTS AND AMOUNT OF SEDIMENTED DUSTS EMITTED FROM A STACK IN THE ATMOSPHERE. *Ochanomizu Joshi Daigaku Shizenkagaku Hokoku (Nat. Sci. Rept., Ochanomizu Univ.), 23(1):27-34, July 1972. 3 refs.*

Mathematical models were constructed to calculate the concentration of suspended and sedimented dusts emitted by stacks into the atmosphere. A two-dimensional model, based on the assumption that the dusts have the same uniform radius and the same density, therefore the same falling velocity, incorporated vertical distribution, time, vertical diffusion coefficient, height, and ground surface parameters. A three-dimensional model for diffusion from a continuous point source incorporated source intensity, wind speed, and diffusion parameters to express the ground level concentration and amount of deposited dust. The numerical calculations are presented.

29497 **APTIC NO. 51494**

Sklarew, Ralph C.

NEXUS. A NEW WAY TO MEASURE. *Pollut. Eng., 4(9):20-21, Dec. 1972.*

Regional air quality modeling requires accurate numerical simulation of the effects of advection and eddy dispersion processes on pollutants emitted into the air from both point and area sources. A new tool, NEXUS (Numerical Examination of Urban Smog), is a mathematical model of air pollution and uses a computer for simulation of transport and diffusion of pollutants in the atmosphere. The techniques employed in NEXUS use the computer to track many parcels of polluted air through a region divided into grid cells. Computer codes predict the flow of pollutants in the atmosphere in three spatial dimensions as a function of time. NEXUS can be used to predict worst-case and nominal air quality, to evaluate the effect on air qaulity of changes in emissions, to develop optimum land use, industrial site locations, roadway routing, and emission controls and to obtain a regional perspective on air pollution throughout a basin, using graphic data presentation. NEXUS also provides qualitative presentation of the results of a simulation in graphic form. It is being used to study photochemical smog in Los Angeles.

29498 **APTIC NO. 51037**

Washington, Warren M.

PREDICTING THE EFFECTS OF POLLUTION. *Facil. Atmos. Res., no. 20:6-12, March 1972.*

The principles of global heat balance are outlined and the general circulation model is used to study the possible effects of thermal pollution on climate. The model takes into account man-made aerosols, gases, thermal emissions, natural distribution of cloud cover, water vapor, and dust. The model shows that extremely large amounts of man-made heat energy could increase surface temperatures over the continents, but that the quantity of heat production expected by the end of the century will probably have a minor effect on climate. Experiments performed have the serious shortcoming of assuming fixed ocean surface temperatures and should be repeated in the future with a coupled atmosphere ocean model. It is suggested that a fourfold increase in atmospheric aerosol content could lead to 3.5 C decrease in the surface temperature by increasing the amount of solar radiation reflected back to space.

29499 **APTIC NO. 51493**

Yamamoto, Giichi and Masayuki Tanaka

INCREASE OF GLOBAL ALBEDO DUE TO AIR POLLUTION. *J. Atmospheric Sci., 29(8):1405-1412, Nov. 1972. 17 refs.*

The effect of increasing particulate concentrations in the atmosphere on the global albedo and the thermal regime of the earth was studied by solving the equation of radiative transfer in model turbid atmospheres. Realistic model atmospheres with respect to size and vertical distributions of aerosols and reflectivity of the earth surface were assumed. Reflectivity at the top of the atmosphere, transmissivity at the earth surface, and absorptivity of turbid atmospheres were calculated as a function of atmospheric turbidity and the complex refractive index of the aerosol. The thermal effect of increasing atmospheric turbidity was greatly affected by the imaginary part of the refractive index. (Author abstract modified)

1971

29500 **APTIC NO. 51051**

Davies, Reg, Don K. Werle, and Walter J. Wnek

SEMIMICRON SEPARATION AND DATA. *IIT Research Inst., Chicago, Ill., Air Force Contract F33657-71-C-0859, Proj. VT/1414/RDE/ASD, ARPA Order 1702, Program Code 1F10, IITRI-C6239-A005-1, 363p., Oct. 31, 1971. 1162 refs.*

NTIS, DDC: AD 739197

The science involved in the separation of submicron particles from a collected sample of atmospheric aerosol is very complex. It involves many facets of the basic sciences, each of which has an equally important role in the separation process. The types of forces and bonds that cause adhesion or separation of particles to and from surfaces, or to each other, are mechanical, Van der Waals, electrical, electrostatic, capillary, electrical double layer, covalent, ionic, metallic, and hydrogen. Aerosols present in the atmosphere are composed of a wide variety of constituents from many sources, both natural and anthropogenic. On a worldwide production basis, it is estimated that 1.6 billion tons of particles below 5 micron in diameter are put into the atmosphere annually, 1/3 of which are converted sulfates, with lesser amounts of converted nitrates, hydrocarbons, and sooty combustion products; and only a small proportion is man-made. A large part comes from mineral and organic particles raised by the wind, ocean spray, wave crests, and photochemical and chemical reactions. The adhesion of atmospheric particles, dispersion, turbidity, pH, electrical conductivity, particle size and shape, surface active agents, and mathematical models of adhesion and agglomeration are also discussed.

29501 **APTIC NO. 51463**

Stowe, Larry Lorin, Jr.

THE EFFECTS OF PARTICULATE MATTER ON THE RADIANCE OF TERRESTRIAL INFRARED RADIATION. *California Univ., Los Angeles, Inst. of Geophysics and Planetary Physics, National Oceanic and Atmospheric Administration Grant E-143-69(G), Rept. COM 71-00999, 121p., July 1971. 19 refs.*

The effects of particulate matter on the radiance of the emerging terrestrial infrared radiation for six wave numbers in the wings and centers of the 6.3-micron water vapor absorption band and the 15-micron carbon dioxide absorption band were theoretically evaluated. Atmospheric models based on measured aerosol particle number densities, radiosonde data, and supplementary theoretical data were used in the computations, characterizing turbid atmospheric conditions in the low, middle, and high latitudes. The radiances of the true and virtual scattering were computed. The effects of turbidity on the emerging radiation were small, reducing the radiance from a clear atmosphere by less than 1% in most cases. However, the effects of turbidity introduced significant errors in quantities used to derive vertical profiles of temperatures and humidity from terrestrial radiation measurements if the presence of particulate matter was disregarded. (Author abstract modified)

29502 **APTIC NO. 51052**

Weil, Jeffrey C. and David P. Hoult

EFFECTIVE STACK HEIGHTS FOR TALL STACKS. *Massachusetts Inst. of Tech., Cambridge, Fluid Mechanics Lab., Pub-71-14, p. 47, Oct. 1971. 19 refs.*

NTIS: N72 16934

A simple method is given to predict the effective stack height for a tall stack and the corresponding ground-level concentrations of the effluents emitted from the stack. The height of the convective mixing region of the atmosphere determines when the effluents are carried to the ground in downward moving air currents. A model to determine the scale of the mixing region is presented and verified with vertical temperature profile measurements. Previous theories on buoyant plume rise are used to determine the effective stack height. For a plume rising in a stable atmosphere the levelled-off height of the plume is shown to be the effective stack height. In a neutral atmosphere the effective stack height is given by the height where the plume rise velocity is equal to the vertical velocity scale in the mixing layer. A total of 760 measurements of the axial ground-level concentration of sulfur dioxide downwind of a 244 m stack are empirically correlated. (Author abstract)

1960

29503 **APTIC NO. 51481**

Islitzer, Norman Frederick

THE ATMOSPHERIC DIFFUSION OF RADIOACTIVE MATERIAL RELEASED FROM THE STACKS AT THE NATIONAL REACTOR TESTING STATION. *Wisconsin Univ., Madison, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1960, 80p. 14 refs.*

The ground-level gamma dose from stack releases of radioactive material was measured by a sodium iodide crystal scintillometer mounted in the bottom of a lead barrel. This restricted the radiation striking the crystal to a small conical part of the cloud and permitted computation of the lateral variance of the diffusing material. Additional data for lateral variance studies were obtained through fallout measurements up to 3 mi from the stack. For moderate winds and temperature lapse conditions, the cloud width to one standard deviation was 5.3 deg. This resulted in a mean value of 0.341 for Sutton s lateral diffusion coefficient; furthermore, there was good agreement between these parameters computed from fallout data and from sky scanner measurements. Aerial sampling in the radioactive plume furnished estimates of vertical cloud widths and cloud rise for hot plumes. The measured mean vertical angular width of 3.2 deg, taken as the width to where activity drops to 10% of peak activity in the cloud center, compared favorably with a computed mean of 2.8 deg. The mean measured angular horizontal width was 26 deg. Measured plume heights were considerably higher than those computed by standard means. In one series of measurements, the cloud axis rose to 900 ft at 4 mi from the stack, and activity above background was recorded 1500 ft above ground at this distance. The computed effective stack height was only 270 ft. Based on theodolite observations of the visible edge of smoke plumes to 4000 ft, a mean value of 0.193 for Sutton s vertical diffusion coefficient was obtained for near-neutral temperature lapse rates. Comparisons of the lateral variances of the diffusing material with the variances of wind direction fluctuations showed good agreement. Wind direction range also correlated well with wind speed and temperature lapse rate; with increasing wind speed and increasingly stability, the direction range decreased. These relationships enable rapid computations of wind direction variance for diffusion forecasts and for calculations of air concentration and radioactive dose-rate.

BASIC SCIENCE AND TECHNOLOGY

1973

29504 **APTIC NO. 51174**

Atkinson, R. and K. H. Welge

QUENCHING RATE CONSTANT FOR O(1S)+NO. *J. Photochem., 1(4):341-344, March 1973. 14 refs.*

The quenching of the metastable singlet S state of oxygen (O(1S)) by nitric oxide was investigated. The rate constant was (5.7 + or 0.6) times 10 to the -10 power cu cm/molecule/sec at 201 K. The half-quenching density was (2.3 + or - 0.3) times 10 to the ninth power molecules/cu cm, suggesting that NO is the dominant quencher in NO-rich auroral forms. (Author abstract modified)

29505 **APTIC NO. 51696**

Berglund, Richard N. and Benjamin Y. H. Liu

GENERATION OF MONODISPERSE AEROSOL STANDARDS. *Environ. Sci. Technol., 7(2):147-153, Feb. 1973. 13 refs.*

A vibrating orifice monodisperse aerosol generator capable of generating primary aerosol standards from a variety of solid and liquid materials is described. The generator produces monodisperse aerosols of a known size from about 0.50 to 50.0 micron in diameter with an average geometrical standard deviation of 1.014. The particle diameter is calculable from the generator operating conditions to an accuracy of better than 2% in routine operations, and ultimately to 0.1% or better accuracy. The generator is very stable in operation with concentration fluctuations showing a relative standard deviation of less than 3%. The generator can be used to generate primary standard aerosols for instrument calibration, aerosol research, and performance testing of particulate control devices. (Author abstract)

29506 **APTIC NO. 51563**

Brown, C. E. and P. G. Hall

PHYSICAL ADSORPTION OF NITRIC OXIDE ON GRAPHITE AND SILICA AND ADSORPTION OF GASES ON NITRIC OXIDE PREADSORBED ON CARBON. *J. Colloid Interface Sci., 42(2):334-341 Feb. 1973. 30 refs.*

The adsorption isotherms of nitric oxide on graphitized and ungraphitized samples of carbon black and silica were measured at 77.5 and 90.2 K. Isoteric heats of adsorption on the graphitized carbon a low coverage were about 12 kJ/mole, increasing to about 18 kJ/mole at coverages above the monolayer. On the ungraphitized carbon, the isosteric heats were close to the enthalpy of sublimation, i.e., 16.6 kJ/mole, of NO. On silica, the isosteric heats of NO varied with surface coverage in the same way as for graphitized carbon and were generally about 2 kJ/mole lower than on the carbon. The adsorption isotherms at 77.5 K of nitrogen, argon, carbon monoxide, krypton, and oxygen were also measured on the graphitized carbon modified with preadsorbed layers of NO. (Author abstract modified)

29507 **APTIC NO. 51553**

Bukatyy, V. N., N. V. Kozlov, and S. S. Khmelevtsov

OPTICAL DETERMINATION OF THE MICROSTRUCTURE OF FREE-FALLING AEROSOL. *(Opredeleniye opticheskim metodom mikrostruktury svobodno padayushchego aerozolya). Text in Russian. Fizika, no. 3:105-107, 1973. 11 refs.*

A preliminary study of artificial aerosol drop spectra, performed on the basis of the Gumprecht-Sliepcevich theory is presented. Calculated spectra were compared to those measured by the optical method. With the radiation-attenuating medium assumed to be a suspension of freely falling, spherical particles, the intensity of the penetrating radiation is gradually increasing, and the size spectrum of particles settling over a given period of time can be calculated from Stoke s law. The size distribution function for any moment of time can be calculated by previously determining the variation of transparency as a function of time. This method is only applicable to cases of single scattering and when Stoke s law is satisfied. The particle size distribution function of stabilized water vapor aerosol was determined experimentally by means of neon-helium laser, photomultiplier, and flow trap. Good agreement between the optically measured particle size distribution function and that determined from transparency was reached.

29508 **APTIC NO. 51529**

Cieslik, S. and M. Nicolet

THE AERONOMIC DISSOCIATION OF NITRIC OXIDE. *Planetary Space Sci., 21(6):925-938, June 1973. 43 refs.*

A detailed study was made of the atmospheric attenuation of nitric oxide in the mesosphere and stratosphere. Particular attention was paid to the penetration of solar radiation in the upper atmosphere and its effects on predissociation of NO. The NO dissociation profile depends on the absorption by the Schumann-Runge bands of molecular oxygen. The major contribution to the dissociation rate is the predissociation of the delta(1-0) and delta(0-0) bands. A sufficiently precise value for the NO photodissociation coefficient will be obtained when the solar flux in the spectral regions lambda lambda 1910 and 1830 A is known with great accuracy. In any case the vertical distribution of the photodissociation constant requires detailed analysis of the rotational absorption of the Schumann-Runge bands. (Author conclusions modified)

29509 **APTIC NO. 51227**

Corice, R. J., Jr., K. Fox, and G. D. T. Tejwani

EXPERIMENTAL AND THEORETICAL STUDIES OF THE FUNDAMENTAL BANDS ON SULFUR DIOXIDE. *J. Chem. Phys., 58(1):265-270, Jan. 1, 1973. 31 refs.*

The structure of an experimental animal exposure chamber and the method of exposing animals to oil combustion products are discussed. The combustion gas used for exposure is supplied from the flues of three oil combustion boilers. The gas is stored in a storage tank, and one channel leads directly into an exposure chamber; the other channel leads the gas into a concentration adjustment box and then into an exposure chamber. Experimental animal group I is exposed to 500 micrograms/cu m gas (low concentration); group II is exposed to the total smoke with particles; group III is exposed to a filtered gas (the smoke of group II minus particles); and group IV is a control group inhaling the air of the lab. The concentration in the exposure chambers is recorded by a light-scattering gas meter every 2.5 min. The accumulated concentrations for group I and group II for the experimental period of 105 weeks are 470 micrograms/cu m and 6.7 mg/cu, respectively. In order to adjust the biological environmental conditions to the optimum survival conditions, temperature, humidity, ventilation, oxygen, carbon dioxide, and ammonia should be maintained at certain levels. In order to prevent the animals death by pneumonia, the environmental conditions were varied and it was decided that with an allowance of temperature rise of 2 C. Under these conditions, the 24-month survival rate for the exposure chamber control group is 78.5% and the room control group is 85%; the 30-month survival rates are 44.4% and 78.5%, respectively.

29510 **APTIC NO. 51151**

DeMore, William B.

RATE CONSTANTS FOR THE REACTIONS OF HYDROXYL AND HYDROPEROXYL RADICALS WITH OZONE. *Science, 180(4087):735-737, May 18, 1973. 11 refs.*

The chain decomposition of ozone by hydroxyl and hydroperoxyl radicals was studied. The rate constant at 300 K for OH + O3 yields HO2 + O2 was 8 times 10 to the minus 14th power cu cm/sec. The rate constant for HO2 + O3 yields OH + 2O2 was 3 times 10 to the minus 15th power cu cm/sec. (Author abstract modified)

29511 **APTIC NO. 51574**

Dunn, O., P. Harteck, and S. Dondes

ISOTOPIC ENRICHMENT OF CARBON-13 AND OXYGEN-18 IN THE ULTRAVIOLET PHOTOLYSIS OF CARBON MONOXIDE. *J. Phys. Chem., 77(7):878-883, March 29, 1973. 11 refs.*

Using the 2062.4-A iodine line, the isotopic enrichment of carbon- 13 and oxygen-18 in the photolysis of carbon monoxide was studied. The isotopic effect was examined in the products of the ultraviolet photolysis of CO containing C-13 O-16, C-12 O-18, and C-13 O-18. Isotope separation factors for C-13 enrichment in C3O2 of 4 and in carbon dioxide of 2.5 and O-18 enrichment in CO2 of 5 for a single-step process were determined, and the mechanism of the photolytic reaction was studied. (Author abstract modified)

29512 **APTIC NO. 51154**

Eley, D. D., C. H. Rochester, and M. S. Scurrell

THE POLYMERIZATION OF ETHYLENE ON CHROMIUM OXIDE CATALYSTS. III. AN INFRARED STUDY ON THE ADSORPTION OF CARBON MONOXIDE ON ACTIVE CATALYST. *J. Catalysis, 29(1):20-30, April 1973. 22 refs.*

Supported chromium (VI) oxide which was pretreated with either ethylene or carbon monoxide at 300 deg C was active for both the polymerization of ethylene and the adsorption of carbon monoxide. The reversible adsorption of carbon monoxide at about 50 deg C was studied using infrared spectrometry. Correlations between the capacity of the catalyst for the adsorption of carbon monoxide and the rate of polymerization showed that carbon monoxide was adsorbed on sites which were catalytically active. The catalyst which was reduced in carbon monoxide developed a higher capacity for adsorption of carbon monoxide and gave higher rates of polymerization than the catalyst reduced in ethylene. Adsorbed carbon monoxide poisoned the polymerization reaction, but evacuation at 50 deg C resulted in a complete recovery of catalytic activity. Partial restoration of the polymerization activity was also effected by displacement of carbon monoxide from some of the active sites when ethylene was contacted with the poisoned catalyst at 50 deg C. The modes of adsorption of carbon monoxide on the catalyst and the nature of the polymerization sites were discussed. (Author abstract)

29513 **APTIC NO. 51705**

French, Margaret A., L. P. Hills, and P. Kebarle

KINETICS AND TEMPERATURE DEPENDENCE OF THE HYDRATION OF NO+ IN THE GAS PHASE. *Can. J. Chem., 51(3):456-461, Feb. 1973. 11 refs.*

The kinetics of the atmospherically important hydration sequence of the positive nitric oxide ion and the transfer reaction were examined in nitrogen containing small quantities of nitric oxide and water with a pulsed high pressure ion source mass spectrometer. The room temperature mechanism and rate constants were in agreement with earlier work in other laboratories. The temperature dependence of the reaction was examined for the range 26-157 deg C. The transfer reaction did not occur at higher temperatures so that the positive nitric oxide ion hydration equilibria for n equals 1 and 2 could be measured. The third order forward clustering rate constants had negative temperature coefficients. (Author abstract)

29514 **APTIC NO. 51160**

Geisler, Kurt W.

NOMOGRAPH FOR INCOMPLETE COMBUSTION. *(Leitertafel fuer unvollkommene Verbrennung). Text in German. Gesundh. Ingr., 94(5):158-161, 1973.*

No combustion is complete. Even with a large air surplus, more or less large quantities of carbon dioxide and carbon monoxide, small quantities of sulfur dioxide, and unburned hydrocarbons develop. If the carbon, hydrogen, oxygen, sulfur, and nitrogen concentrations of the fuel are known, the dimensionless parameter epsilon can be calculated. With it the given nomograph with three lines will indicate the relationship between the flue gas fractions of CO2, CO, and O2 as well as the fuel-to-air-ratio lambda.

29515 **APTIC NO. 51717**

Ghormley, J. A., R. L. Ellsworth, and C. J. Hochanadel

REACTION OF EXCITED OXYGEN ATOMS WITH NITROUS OXIDE. RATE CONSTANTS FOR REACTION OF OZONE WITH NITRIC OXIDE AND WITH NITROGEN DIOXIDE. *J. Phys. Chem., 77(11):1341-1347, 1973. 37 refs.*

The ratio of rate constants for reaction of excited oxygen atoms with oxygen and with nitrous oxide was 0.31 + or 0.01. This reaction proceeds predominantly by two paths giving either nitrogen and oxygen or nitric oxide. The rate constants for the reaction of ozone and NO and the reaction of O3 with nitrogen dioxide are reported. The excited ogygen atoms were produced by flash photolysis of O3 at low concentration in an atmosphere of O2 plus N2O, and the rates of reaction of O3 with NO and with NO2, both produced in situ, were measured by means of kinetic spectrophotometry. (Author abstract modified)

29516 **APTIC NO. 51173**

Harker, Alan B. and H. S. Johnston

PHOTOLYSIS OF NITROGEN DIOXIDE TO PRODUCE TRANSIENT O, NO3, AND N2O5. *J. Phys. Chem., 77(9):1153-1156, April 26, 1973. 19 refs.*

Nitrogen dioxide was photolyzed at room temperature in a long-path infrared cell to produce oxygen, nitrogen trioxide, and nitrogen pentoxide. The concentrations of NO2 and N2O5 were followed as a function of time, and the molecular modulation spectrum of NO2 was determined in a steady-flow experiment. The rate constant ratios and standard deviations were derived at 1 atm of nitrogen. (Author abstract modified)

29517 **APTIC NO. 51183**

Homer, John B. and Andrew Prothero

NUCLEATION OF HIGHLY SUPERSATURATED VAPORS. *J. Chem. Soc., 69(4):673-684, April 1973. 14 refs.*

The decomposition of tetramethyl lead in argon and in the air was studied to determine the rate of condensation and oxidation of the highly supersaturated vapor to yield smokes of lead and lead oxide. A mathematical model was developed for the observed condensation rates and to predict the particle size and number density of the smoke. The rate of nucleation was high and corresponded closely to the expected rate of formation of Pb2 in the system. (Author abstract modified)

29518 **APTIC NO. 51715**

Hull, Leslie A., I. C. Hisatsune, and Julian Heicklen

THE REACTION OF O3 WITH CCL2CH2. *Can. J. Chem., 51(10):1504-1510, May 15, 1973. 10 refs.*

The gas-phase reaction of ozone with 1,2-dichloroethylene at 25 C was studied by monitoring O3 consumption by ultraviolet absorption and product formation and olefin consumption by infrared absorption. Experiments were done in both the absence and presence of excess nitrogen and both by adding the olefin to the O3 and vice versa. All experiments were done with initial O3 pressures less than 2 torr. The products of reactions were phosgene, formic acid, CH2ClCl(O), carbon monoxide, oxygen, hydrochloric acid, and presumably water. In the absence of O2, the CCl2CH2 to O3 consumption ratio approached two, but the phosgene produced per O3 consumed was between 0.25 and 0.4. With excess O2, the latter ratio becomes unity, but the CCl2CH2 to O3 consumed approaches five. The results are interpreted in terms of chain mechanism with CCl2O2 as the chain carrier. The mechanism developed explains the main features of the reaction. (Author abstract modified)

29519 **APTIC NO. 51539**

Husar, Rudolf B. and Kenneth T. Whitby

GROWTH MECHANISMS AND SIZE SPECTRA OF PHOTOCHEMICAL AEROSOLS. *Environ. Sci. Technol., 7(3):241-247, March 1973. 12 refs. (Presented at the California Institute of Technology, Symposium on Science in the Control of Smog, Pasadena, Calif., Nov. 1971.)*

The size distribution and concentration of aerosols were examined based on photochemical aerosol aging experiments in a smog chamber to determine the role of various physical mechanisms, including nucleation, coagulation, and condensation in photochemical aerosol formation. In an initially particle-free system, the aerosol passes through nucleation-condensation, nucleation-condensation-coagulation, condensation, and coagulation. If suitable foreign nuclei are present, in sufficient quantity, however, the gas-to-particle conversion occurs preferentially on the existing nuclei, i.e., the nucleation is heterogeneous. During smog formation in the urban atmosphere, therefore, the nucleation occurs heterogeneously, while in sparsely populated areas the nucleation in homogeneous. (Author abstract modified)

29520 **APTIC NO. 51501**

Kaji, Hironari

COMPARISON OF THE PHOTOCHEMICAL REACTION PRODUCT OF CAR EXHAUST GAS WITH ATMOSPHERIC SMOG COMPOSITION. *(Sumoggu taikiseibun to jidosha haikigasu no kokagaku hanno seiseibutsu no hikaku). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, Inc., Tokyo, p. 81-85, 1973. (Presented at the Society of Automotive Engineers of Japan, Study Meeting, 27th, Tokyo, May 23-24, 1973, Paper 9.)*

The photochemical reaction products from automobile exhaust gas irradiated with ultraviolet light were compared to atmospheric smog composition. Gas chromatography was used to measure hydrocarbons. The changed substances produced by the photochemical reaction of aromatic hydrocarbons in automobile exhaust such as toluene seemed to simulate the substances occurring during photochemical smog. Acrolein produced by the reaction of aromatic HC causes eye irritation. Methyl nitrate, and ethyl nitrate and nitrate esters of these compounds were produced in great quantities.

29521 **APTIC NO. 51258**

Lalo, C. and C. Vermeil

PHOTOLYSIS OF SO2 AT 123.6 NM IN THE PRESENCE OF H2. *J. Photochem., 1(4):321-325, March 1973. 6 refs. (Presented at the Informal Photochemistry Conference, 10th, Stillwater, Okla., May 15-18, 1972.)*

The photodecomposition of sulfur dioxide in the vacuum-ultraviolet range was studied at the krypton resonance line of 123.6 nm to observe the formation of sulfur trioxide. At this wavelength the adsorption coefficient value of SO2 is high and the energy is high enough to dissociate the SO2, forming either sulfur and oxygen fragments with the sulfur atoms in the 1S, 1D, or 3P states and the oxygen molecule in the singlet-sigma positive, singlet-delta, or triplet-sigma negative states; or SO and O fragments with the oxygen atom in the 1S, 1D, or 3P states and the radical SO in the singlet-sigma, singlet-delta, or triplet-sigma states. (Author abstract modified)

29522 **APTIC NO. 51534**

Lighthart, Bruce

SURVIVAL OF AIRBORNE BACTERIA IN A HIGH URBAN CONCENTRATION OF CARBON MONOXIDE. *Appl. Microbiol., 25(1):86-91, Jan. 1973. 35 refs.*

The effect of carbon monoxide on the survival of airborne bacteria was investigated using vegetative cells of Serratia marcescens 8UK and Sarcina lutea and spores of Bacillus subtilus var. niger in aerosols with and without urban concentrations of CO (85 ppm) for up to 6 hr at 15 C and relative humidities (RH) of 0, 25, 50, 75, and 95%. The CO enhanced the death rate of S. marcescens 8UK at least 4-7 times at low RH (1-25%) but protected the cells at high RH (90%). Death rates of S. lutea were comparatively low over the entire RH range. In the first hour, however, airborne S. lutea held in CO-air were more stable than those in air without added CO. The death rate increased markedly in the subsequent 5 hr within the RH range 0-75%. Aerosol decay rates of B. subtilus var. niger spores decreased significantly in the CO-atmosphere within the RH range of 0-85%. (Author abstract modified)

29523 **APTIC NO. 51186**

Loyalka, S. K.

CONDENSATION ON A SPHERICAL DROPLET. *J. Chem. Phys., 58(1):354-356, Jan. 1, 1973. 12 refs.*

The problem of condensation on a spherical droplet situated in an infinite expanse of an isothermal vapor diffusing through a heavy background gas was studied. The BGK model was used, and the condensation rate was calculated using data on neutron transport. (Author abstract modified)

29524 **APTIC NO. 51535**

Miller, Paul R. and Ronald M. Yoshima

SELF-VENTILATED CHAMBERS FOR IDENTIFICATION OF OXIDANT DAMAGE TO VEGETATION AT REMOTE SITES. *Environ. Sci. Technol., 7(1):66-68, Jan. 1973. 6 refs.*

Self-ventilated chambers were developed to identify both acute and chronic oxidant air pollution damage to vegetation in remote locations. No electricity is required for the operation of the chambers. Two chambers are used -- one with activated carbon filters to filter all incoming air and the other with no filters. Ventilation is provided by the natural convection of warmer air in the plant enclosure chamber at the bottom upward through the cooler stack. The air is exhausted through a wind-driven rotating ventilator which further enhances the air flow. The chamber were used to study oxidant-sensitive herbaceous indicator plants. The plants exposed to 0.10-0.41 ppm oxidant showed no visible injury. Tolerant and sensitive conifers were also exposed in the chambers. (Author abstract modified)

29525 **APTIC NO. 51378**

Nosaki, Koyu

A TRIAL MODEL OF A BREATHING SIMULATOR. *(Kokyu simulator no shisaku). Preprint, Japan Society of Industrial Hygiene, p. 138-139, 1973. Text in Japanese. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 225.)*

A physiological respiratory function model simulating the works of the heart and lungs was constructed. The system either reproduces electric function directly or reproduces actual breathing patterns taped on magnetic tapes. It has a permanent storage of various types of breathing patterns and any desired type can be reproduced. A pneumotachograph converts breathing velocity and waves into electric pressure, and the simulator reproduces the waves. The simulator has three circuits. One converts the signals of the magnetic tape into cumulative signals and manipulates the cylinder of the simulator. The second is based on an assumption that the breathing air velocity and the velocity on the cylinder variation are the same, and the fluctuation on the cylinder is always coordinated with the magnetic signal tape. The third is manipulated so that the signals of pneumotachograph is always coordinated with the output signal of the magnetic tape. Three methods all have advantages and disadvantages. If a pneumotachograph of superior quality can be obtained, the third is theoretically the best. There are some errors caused by the depth of breathing. However, when improvements are made on the electric parameter adjustment, on the pneumotachograph, and on the measuring method of ventilation quantity, the errors will be minimized.

29526 **APTIC NO. 51251**

Otto, K. and M. Shelef

THE ADSORPTION OF NITRIC OXIDE ON PLATINUM BLACK. *J. Catalysis, 29(1):138-143, April 1973. 12 refs.*

Adsorption isotherms for nitric oxide chemisorption on reduced and oxidized platinum black were measured in the range from minus 78 to 100 deg C. Monolayer coverage, attained by extrapolation of the Freundlich isotherms, yielded a one to one correspondence between adsorbed NO molecules and Pt atoms in the surface. The chemisorption characteristics of nitric oxide on platinum showed a close resemblance to those observed on transition of metal oxides. Coefficients of Freundlich isotherms for reduced and oxidized surfaces are presented, and the balance of sites and surface species in the adsorption-desorption experiment are given. (Author abstract modified)

29527 **APTIC NO. 51392**

Paronyan, R. V., V. K. Sarkisyan, and A. B. Nalbandyan

REACTION OF CARBON MONOXIDE WITH HYDROGEN UNDER NON-ISOTHERMAL CONDITIONS. *(Reaktsiya okisi uglcroda s vodorodom v neizotermicheskikh usloviyakh). Text in Russian. Army Khim. Zh. (Erevan), 26(1):74-75, 1973. 5 refs.*

The reaction of a mixture of 25% of carbon monoxide with 25% of hydrogen in 50% of argon was studied under adiabatic compression and expansion conditions. The reaction products were analyzed by the gas chromatographic method. At compression ratios of up to 70, formaldehyde, methanol, and other oxygen-containing substances were determined quantitatively as reaction products. Reactions conducted under compression ratios exceeding 70 yielded methane which, with more than 2% of the initial amount of CO, was the principal reaction product, as well as ethylene, ethane, and acetylene.

29528 **APTIC NO. 51578**

Persiani, Carmine and William D. Shelby

NONDESTRUCTIVE INSTRUMENTAL MONITORING OF FUEL OIL FOR VANADIUM, SODIUM, AND SULFUR. *Environ. Sci. Technol., 7(2):125-127, Feb. 1973. 6 refs.*

An analytical method was developed for monitoring the contaminants in commercial grade heating fuel. Neutron activation analysis was used to determine the sodium and vanadium content and X-ray fluorescence was used to determine the sulfur content of fuel oils. The methods are direct and nondestructive and require little sample preparation time. The results of measurements were in good agreement with results obtained by standard methods. (Author abstract modified)

29529 **APTIC NO. 51139**

Rolker, J.

STUDIES CONCERNING THE SULFURIC ACID DEW POINT DETERMINATION IN FLUE GASES. *(Untersuchungen zur Schwefelsaeure-Taupunkt- Bestimmung in Rauchgasen). Text in German. VGB Kraftwerkstechnik, 53(5):333-339, May 1973. 16 refs.*

After a review of sulfur trioxide formation and a brief explanation of the connection between SO3 concentration and acid dew point, the dew point measurement is discussed. The electric dew point measurement according to the principle of determining the conductivity of condensating acid films is based on the measurement of the change of the electric resistance between two electrodes on formation of a conducting liquid film on an initially dry non-conducting surface of the measurement probe. An experimental set-up was used with which test gases of defined composition (air, water, SO3 and sulfur dioxide could be reproducibly produced. The measurement set-up was installed into a furnace of a remote heating plant. With a new glass dew point measuring probe with point electrodes made of 70% gold and epoxy resin the condensation of sulfuric acid and water was observed with a microscope and photographed. Pictures were taken 0.9 min, 2.2 min, 4 min, and 7.2 min after the temperature dropped below the dew point. A marked droplet condensation was observed. The droplet size grew with time and the droplet number per surface unit dropped. Upon contact of two growing droplets they united to one larger droplet. Through this a new free surface was created for formation of new small droplets which would then steadily grow again. The first droplets formed preferably on salt and dust residues. The electric resistance between the electrodes depended strongly on the measurement voltage.

29530 **APTIC NO. 51150**

Roy-Chowdhury, Anil K., Thomas F. Mooney, and Andrew L. Reeves

TRACE METALS IN ASBESTOS CARCINOGENESIS. *Arch. Environ. Health, 26(5):253-255, May 1973. 14 refs.*

Concentrations of trace metals judged potentially carcinogenic were determined in samples of amosite, crocidolite, and chrysotile. The samples included commercial material as shipped, milled, and processed material as collected in animal exposure chambers, and International Union Against Cancer (UICC) reference samples. The metals determined were cobalt, nickel, chromium, manganese, and iron. The samples were treated with hydrofluoric acid, the residue taken up with hydrochloric acid, and the determination made by atomic absorption spectrometry. Substantial enrichment of the dusts in nickei and chromium during milling and dissemination was found. Cobalt and nickel content was different from that in UICC samples. The results of the analytical determinations are listed. (Author abstract)

29531 **APTIC NO. 51452**

Scarano, Elio, Michele Forina, and Claudio Calcagno

GASEOUS STANDARD SOLUTIONS OF SULFUR DIOXIDE. *Anal. Chem., 45(3):557-562, March 1973. 15 refs.*

Gaseous standard solutions (GSS) were prepared directly before use with the saturation method, passing the inert gas through a suitable liquid solution. The composition of the GSS was independent of the gas flow rate. The GSS thus obtained is passed through the solution, leaving it in the gaseous reagent. Progress in the development of gaseous standard solutions is discussed, as well as in the development of the apparatus and procedures for using them as substitutes for liquid standard solutions. The advantages of both gaseous and liquid standard solutions are reviewed, including the effects of pressure, temperature, and water content. Sulfur dioxide solutions were made in the gaseous concentration range of 0.0000006 to 0.0012 M (15-30,000 ppm v/v) with a relative standard deviation of 0.1-0.3% and of comparable accuracy. The developed apparatus is ready for use at any moment, even after long periods of non-use. (Author abstract)

29532 **APTIC NO. 51132**

Spurny, Kvetoslav and James P. Lodge, Jr.

MANUFACTURE OF HIGHLY DISPERSE MODEL AEROSOLS FOR DUST RESEARCH AND FILTER TESTS. *(Herstellung hochdisperser Modellaerosole fuer Staubforschung und Filterpruefung). Text in German. Staub, Reinhaltung Luft, 33(4):166-169, April 1973. 14 refs.*

The methods for the preparation of high dispersed inorganic aerosols by means of condensation of supersaturated vapors are described: the vaporizing the inorganic compounds in furnaces, the vaporizing of oxides from the surface of wires and metallic tubes. The preparation conditions and the properties of silver, silver iodide, iron oxide, mercury, sodium chloride, platinum oxide, sulfur, vandadium oxide, and other aerosols are described. The methods of radioactive labelling of vaporizing material are also mentioned. Many of those aerosols seem to be useful for applications in aerosol physics, aerosol chemistry, biological research and for the testing of high efficiency filters.

29533 **APTIC NO. 51255**

Stephens, Robert J. and Michael J. Evans

SELECTION AND ORIENTATION OF LUNG TISSUE FOR SCANNING AND TRANSMISSION ELECTRON MICROSCOPY. *Environ. Res., 6(1):52-59, March 1973. 9 refs.*

The response of lung tissue to low-level administration of many noxious agents is focally related to certain anatomical structures and, thus, a random selection of small pieces of tissue for electron microscopy is very difficult, if not impossible, to interpret. The technique described here permits the precise acquisition and orientation of the desired area so that observations made with the light microscope and both the transmission and scanning electron microscopes can be closely correlated to the organization of the tissue. After fixation which is accomplished by perfusion through the airways, 1 mm slices of tissue are prepared, dehydrated, and cleared prior to observation with a stereozoom dissecting microscope. Small pieces of tissue (terminal bronchioles and adnexa) are selected and dissected out of the 1 mm slices. If they are to be used for scanning electron microscopy, they are dried via carbon dioxide critical-point substitution; or they are flat-embedded for transmission microscopy. Subsequent handling ensures accurate comparison of experimental and control tissues. (Author abstract)

29534 **APTIC NO. 51202**

Thean, James E. and Russell H. Johnsen

CHARGE EXCHANGE REACTIONS OF NO+ WITH NOBLE GASES AT 2800 EV ENERGY. *Int. J. Mass Spectrom. Ion Phys., 11(2):197-204, April 1973. 15 refs.*

Charge exchange cross sections for the positive nitric oxide ion (NO+) in the triplet delta and singlet sigma positive states with the noble gases were measured using a modified spectrometer. The final state of the NO molecule in the triplet delta ion was the excited state, while for the lower energy singlet sigma positive ion, the ground state molecule was indicated. (Author abstract modified)

29535 **APTIC NO. 51263**

Volz, Frederic E.

INFRARED OPTICAL CONSTANTS OF AMMONIUM SULFATE, SAHARA DUST, VOLCANIC PUMICE, AND FLY ASH. *Appl. Opt. 12(3):564-568, March 1973. 12 refs.*

Spectra of the real and imaginary parts of the refractive index from 2.5 to 40 micron, of ammonium sulfate, Sahara dust (collected at Barbados), volcanic dust (Pumice), and dust from a coal-fired power plant are presented. With a peak absorption index of 1.0 at 10 micron, Sahara dust is the strongest absorber in the atmospheric window. The dispersion of peak absorption is also very pronounced near 9 and 20 micron. Volcanic and coal-fire dust also absorb in the window region stronger than most of the earlier-investigated more normal aerosol fractions. The data for ammonium sulfate are compared with Remsbergs measurement on an aqueous solution. (Author abstract modified)

29536 **APTIC NO. 51219**

Wever, R., F. X. R. Van Leeuwen, and B. F. Van Gelder

THE REACTION OF NITRIC OXIDE WITH CERULOPLASMIN. *Biochim. Biophys. Acta (Amsterdam), 302(2):236-239, April 12, 1973. 13 refs.*

The reaction of nitric oxide with oxidized ceruloplasmin was studied. Experimental procedures and materials are described. Nitric oxide is capable of forming a diamagnetic charge-transfer complex with type-1 copper, whereas type-2 copper was unaffected. A comparison of the intensities of the EPR signals before and after treatment with NO showed that depending on the number of copper atoms per molecule, ceruloplasmin contains one type-2 and two or three type-1 copper atoms per molecule. (Author abstract)

29537 **APTIC NO. 51421**

Wiebe, H. A., Alberto Villa, T. M. Hellman, and Julian Heicklen

PHOTOLYSIS OF METHYL NITRITE IN THE PRESENCE OF NITRIC OXIDE, NITROGEN DIOXIDE, AND OXYGEN. *J. Am. Chem. Soc., 95(1):7-13, Jan. 10, 1973. 23 refs.*

The photolysis of methyl nitrate at 3660 A and 25 plus or minus 2 C was studied in the presence of nitric oxide, NO plus nitrogen dioxide, and NO plus oxygen. In many runs nitrogen was added to ensure that the reaction was in the high-pressure limit. The products of the reaction were formaldehyde, water, nitrous oxide, and methyl nitrate. The primary photolytic process is the cleavage of CH3ONO to CH3O and NO. Reaction kinetics of various reactions are presented. (Author abstract modified)

1972

29538 **APTIC NO. 51029**

California Univ., Livermore, Lawrence Livermore Lab.

PRODUCING TAGGED OZONE FOR RESPIRATORY UPTAKE MEASUREMENTS. *In: Hazards Control Progress Report No. 43, May Through August 1972, p. 1-3, Oct. 1972.*

NTIS: UCRL-50007-72-2

Tagged ozone wwas generated in sufficient quantity to investigate its lung deposition sites by coincidence counting techniques. The experimental apparatus consisted of a target area, gas purification apparatus in a trailer, and ozone and radiation detectors. The tagged ozone production procedure is described.

29539 **APTIC NO. 51116**

Gildenskiold, R. S.

A HORIZONTAL CAGE FOR CHRONIC INOCULATION OF ANIMALS WITH FINELY DISPERSED DUST AND GASES. *(Gorizontalnaya kamera dlya khronicheskoy zatravki zhivotnykh melkodispersnoy pylyu i gazami). Gigiena i Sanit., 37(3):79-83, March 1972. 4 refs. Translated from Russian, 7p.*

A model inoculation cage to study the biological effect of various chemical aerosols on laboratory animals was developed.

The design, instrumentation, and use are examined. Experimental operational testing included studies of air flow rate, dust control, and ease of operation and maintenance.

29540 **APTIC NO. 51300**

Husain, D., L. J. Kirsch, and R. J. Donovan

A KINETIC STUDY OF O(2(3)P-SUB J) ATOMIC ABSORPTION SPECTROSCOPY FOLLOWING THE FLASH PHOTOLYSIS OF OZONE. *J. Photochem., 1(1):69-73, Sept. 1972. 19 refs.*

The reaction kinetics of the second triple P state of the oxygen atom following the flash photolysis of ozone were studied by atomic absorption spectroscopy. The time-dependence of that state was analyzed to obtain a value for k1-k2 together with an upper limit for k2, thus yielding a direct measurement of k1. The experimental procedure and results are examined.

29541 **APTIC NO. 51603**

Jaffe, Raphael J.

STUDY OF FACTORS AFFECTING REACTIONS IN ENVIRONMENTAL CHAMBERS. FINAL REPORT ON PHASE I. *Lockhead Missiles and Space Co., Sunnyvale, Calif., Space Systems Div., Coordinating Research Council Contract CAPA 1-69(1-71), Environmental Protection Agency Contract 68-02-0038, Proj. LMSC/A997745, EPA-R3-72-016, 109p., May 20, 1972. 20 refs.*

NTIS: PB 212715

An environmental irradiation chamber was designed and fabricated for use in a study of factors affecting reactions in environmental chambers. The chamber is illuminated with a collimated beam of light from a solar illumination simulator consisting of a xenon arc lamp and optical system, to facilitate subsequent studies in which various surface materials and surface/volume ratios will be used, and the incident radiation will be varied in spectrum, intensity, and time behavior. The environmental chamber is constructed of Pyrex glass and Teflon coated aluminum extrusions, and sealed with silicone rubber. The following chamber characteristics were determined: leakage rate of 0.4%/hr, nitrogen dioxide absorption of 0.4%/hr; and ozone halflife of 10.6 hr (in the dark at 75 F) and 3.5 hr (in the light at 95 F). Photolysis of NO2 shows the apparent first order reaction rate constant of 0.35/min. Three replicate photochemical runs with the propylene/nitrogen oxide system (3 ppm/1.5 ppm) were conducted. The following average values were determined: NO2 formation rate 15 ppb/min; time to NO2 maximum - 82 min; NO2 dosage 160 ppm-min; maximum oxidant concentration - 0.56 ppm; time to oxidant maximum 130 min; oxidant dosage - 88 ppm-min; and time to destroy half of the initial propylene 98 min. These calculated values for the reaction manifestations are within the range of values reported by the Coordinating Research Council CAPI-6 group for the same reactant system photochemically reacted in the various environmental chambers. The half-time for hydrocarbon disappearance ranges from 60 to 180 min for the various chambers, compared to 98 min for the subject chamber. This indicates that the subject chamber will be useful in the future experimental program, in that the starting configuration gives results similar to those previously obtained. (Author summary modified)

29542 **APTIC NO. 51692**

Kotrappa, P. and C. J. Wilkinson

DENSITIES IN RELATION TO SIZE OF SPHERICAL AEROSOLS PRODUCED BY NEBULIZATION AND HEAT DEGRADATION. *Am. Ind. Hyg. Assoc. J., 33(7):449-453, July 1972. 13 refs.*

An aerosol particle separator, a spinning spiral aerosol spectrometer, was used to determine the density of aerosol particles by measuring the particle diameter and the associated aerodynamic diameter over an aerodynamic size range of 0.3 to 3.5 micron. The density of uranine aerosol was 1.48 gm/cu cm and was relatively constant with respect to size. The density of iron oxide aerosol was also relatively constant with respect to size and had values ranging from 2.2 to 2.6 gm/cu cm, and the densities were independent of particle size. Densities of aerosols of uranium, cobalt, zirconium, and plutonium oxides produced by heat degradation appeared to have a size dependence depending on the starting material. (Author abstract)

29543 **APTIC NO. 51181**

Lissi, Eduardo and Julian Heicklen

THE PHOTOLYSIS OF OZONE. *J. Photochem., 1(1):39-68, Sept. 1972. 67 refs.*

Ozone was photolyzed at 25 C with steady illumination at wavelengths of 2288-2850 A, at O3 pressures of 0.1-2.7 torr, and at adsorbed intensities of 0.15-65 m torr/min. Experiments were conducted in pure dry O3 and in the presence of helium, carbon dioxide, nitrogen, water, hydrogen, nitrous oxide, He-CO2, He-H2O, CO2-H2O, O2-N2O, CO2-O2, and nitric anhydride-O2-CO2 mixtures. In the absence of added gases or in the presence of He, the quantum yield of O3 consumption was 5.5 independent of conditions, except at pressures below 0.4 torr when the yield dropped toward 5.0 because of wall deactivation. In the presence of CO2 or N2, the yield decreased toward 4.0. With H2O present, the yield increased in a chain reaction whose importance was proportional to (O3) at constant (O3)/(H2O) ratios. In the presence of N2O, the yield decreased toward 4.0 at low conversions but reached 2.8 at extended conversions. Relative quenching constants for the metastable singlet D state of oxygen are also reviewed. Complete reaction mechanisms are examined. (Author abstract modified)

29544 **APTIC NO. 51412**

Masuda, Hiroaki and Koichi Iinoya

MEAN PARTICLE DIAMETER IN AN ANALYSIS OF A PARTICULATE PROCESS. *Mem. Fac. Eng., Kyoto Univ., 34(4):344-358, Oct. 1972. 11 refs.*

The importance of mean particle diameter in an analysis of a particulate process was investigated. An experimental value was divided into two terms, one with some interaction between particles and the other without such interaction (the linear term). The mean particle diameter was defined only in terms of the linear term. Scattering in the particulate process is attributable to the fact that the mean diameter was not determined correctly. If the mean diameter is determined correctly, a satisfactory result with little scattering in the data is achieved. The practical method for determining the mean diameter and suggestions for its use are given. The relation between the process variables observed when the distribution was log-normal is also discussed. Mean particle diameters are used in absorption, adsorption, agglomeration, drying, dust and mist collection, evaporation, fluidized beds, and heat transfer. (Author abstract modified)

29545 **APTIC NO. 51441**

Mohnen, Volker A.

NEGATIVE IONS IN AIR-LIKE GAS MIXTURES. *Pure Appl. Geophys. (Basel), 100(8):123-132, 1972. 4 refs.*

The nature of the negative ions in an air-like gas mixture containing 300 ppm of carbon dioxide and 1 ppm of water was investigated. The apparatus, experimental procedure, and data analysis are reviewed. The most dominant ion under equilibrium conditions was the negative ion CO4-H2O. (Author summary modified)

29546 **APTIC NO. 51607**

Raabe, O. G.

OPERATING CHARACTERISTICS OF TWO COMPRESSED AIR NEBULIZERS USED IN INHALATION EXPERIMENTS. *In: Annual Report of the Fission*

Product Inhalation Program. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., p. 1-6, Nov. 1972. 2 refs.

NTIS: LF-45

Nebulizers operated with compressed air were used for generating radioactive aerosols of both relatively soluble and relatively insoluble forms from aqueous solutions and suspensions for inhalation experiments. The Lovelace and the Retec nebulizers were used in the program. Selected operating characteristics of representatives of each of these nebulizers were studied to determine the output of usable aerosol, the volumetric rate of air required, the droplet size distribution of usable aerosol, and the rate of air required, the droplet size distribution of usable aerosol, and the rate of evaporation of water which was not associated with the aerosol. The Lovelace nebulizer had a basic aerosol output of about 50 microliters/min of aerosol in an airflow of about 1.3 l/min at an operating pressure of 20 psig. The Retec nebulizer had a basic aerosol output of about 200 microliters/min in about 6 l/min airflow at an operating pressure of 20 psig. The droplet distributions for these two nebulizers were similar and in the respirable size group; the largest droplets had a volume median diameter of 6.9 micron and a geometric standard deviation of 1.7 from the Lovelace nebulizer operating at 20 psig. (Author abstract)

29547 **APTIC NO. 51180**

Rebbert, R. E. and P. Ausloos

PHOTOLYSIS OF METHANE: QUANTUM YIELD OF C(1D) AND CH. *J. Photochem., 1(2):171-176, Nov. 1972. 27 refs.*

Methane was photolyzed at varying wavelengths to determine the quantum yields of the metastable singlet D state of carbon and the doublet pi state of methane formed in the photodissociation of CH4. At 123.6 nm, the quantum yield for C was 0.4 + or 0.1 times 10 to the -3rd power, and the quantum yield for CH was 5.9 + or 0.5 times 10 to the -2nd power. At 104.8-106.7 nm, the quantum yields were 6.5 + or 0.5 times 10 to the -3rd power for C and 0.23 + or 0.03 for Ch. (Author summary modified)

29548 **APTIC NO. 51287**

Spicer, Chester W. and Julian Heicklen

A KINETIC STUDY OF THE REACTION OF NITROGEN DIOXIDE WITH TETRAFLUOROETHYLENE. *Intern. J. Chem. Kinet., 5(6):575-589, Nov. 1972. 19 refs.*

The reaction of nitrogen dioxide with tetrafluoroethylene was studied at 30, 68, 114, and 157 C by in situ monitoring the infrared absorption bands of the products. The major primary products of the reaction were beta-nitrodifluoracetyl fluoride and nitrosyl fluoride, with smaller amounts of carbonyl fluoride and nitric oxide. The rate laws for the production of both O2NCF2CFO and CF2O were first order in both NO2 and C2F4. Reaction kinetics and mechanisms were investigated. (Author abstract modified)

29549 **APTIC NO. 51682**

Stein, R. L. and W. H. Ryback

AEROSOL DEPOSITION ON A CHARGED PLASTIC SURFACE. *Ann. N. Y. Acad. Sci., vol. 200:737-746, Dec. 1972. 13 refs.*

The interactions of a charged aerosol with a charged surface were investigated in wall-loss studies with coal and fluorescent pigment (zinc cadmium sulfide) aerosols, dispersed by both spray and dry techniques and vented into a polystyrene sphere. The sphere was charged and cleaned by dry-wiping, while particle concentrations in the sphere were measured with an optical particle counter. Concentration decreased for spray and dry-dispersed aerosols which were much more rapid than for a neutralized aerosol that has a Boltzman charge distribution. The rapid concentration decreases implied that wall-loss involved an electrostatic mechanism and that mean charge values of coal and fluorescent pigment aerosols were considerably in excess of Boltzman equilibrium values. Of the aerosols, coal dispersed by the dry technique had the greatest mean charge; moreover, the population of particles with few charges in either dry dispersed aerosol was quite low. These results are supported by other independent studies. They indicate that plastic, with its ability to man a natural electrostatic charge with no externally applied power, can be used for dust suppression in coal mines.

29550 **APTIC NO. 51689**

Wehner, Alfred P., Douglas K. Craig, and Bruce O. Stuart

AN AEROSOL EXPOSURE SYSTEM FOR CHRONIC INHALATION STUDIES WITH RODENTS. *Am. Ind. Hyg. Assoc. J., 33(7):483-487, July 1972. 3 refs.*

Operating principles and the technical details of an aerosol exposure system for conducting chronic inhalation studies with up to 102 individually caged rodents are described. The system provides for the simultaneous whole-body exposure of the animals in a single tier; it is easy to operate, and requires little maintenance. The system was tested in several exploratory studies with aerosols of cobalt oxide, nitric oxide, and chrysotile asbestos. It is now being used for long-term inhalation studies with these aerosols. Mean concentrations of respirable aerosols were maintained during one 5 mo period within standard deviations of about 20%. Aerosol concentration measurements and remarkably little variation in the quantity of dust deposited in the lungs of exposed hamsters showed that the aerosols were evenly distributed across the diameter of the chambers. (Author abstract)

1971

29551 **APTIC NO. 51479**

Ethyl Corp.

THE EFFECT OF MANGANESE ON THE OXIDATION OF SO2. *Preprint, 5p., Oct. 1971.*

The oxidation of sulfur dioxide is discussed. Sulfur dioxide emitted into the atmosphere is partially converted to sulfuric acid and sulfates. Sunlight, ammonia, and certain metal compounds promote this reaction. The rate of the photochemical reaction was reported to be 0.1-0.2%/hr in various studies. Manganese, iron, and copper at high concentrations and very high humidities catalyze the oxidation of sulfur dioxide. Concentrations of manganese of 2 micrograms/cu m catalyze the oxidation at a rate that is less than the photochemical rate. This level of manganese is 20 times the average current level in ambient air. Experimental work demonstrated that the oxidation of sulfur dioxide is very slow at expected levels of manganese in air and is insignificant compared to the effect due to ammonia. The experimental work confirmed the literature indicating current levels of ammonia in the atmosphere are the main cause of the oxidation of sulfur dioxide. Almost all ammonia in the atmosphere is due to natural causes. There is little likelihood that concentrations of ammonia will decrease in the future. Manganese catalysis of sulfur dioxide will remain insignificant under these conditions. (Author summary)

29552 **APTIC NO. 51050**

Greenberg, Raymond I.

REACTIONS OF O(1D) WITH NITROUS OXIDE AND METHANE. *Pennsylvania State Univ., University Park, Ionosphere Research Lab., National Science Foundation Grant 6A-12385, GP-27758, and 6P-5611X, National Aeronautics and Space Administration Grant NGL-009-003, National Air Pollution Control Administration Fellowship IF03-AP-47, 519-01, Rept. PSU-IRL-SCI 372, 108p., July 1971. 43 refs.*

NTIS: N71-35441

The reactions of electronically excited oxygen atoms were studied translationally hot and thermally equilibrated in two systems: the photolysis of nitrous oxide at 2139 A; and the photolysis of N2O-methane mixtures at 2139 A. The relative rate constants ratio for the reactions was determined by the use of a new technique, the method of chemical difference, in situ chemical titration technique. In the photolysis of N2O-CH4 mixtures, the detailed mechanism was elucidated and relative rate constants were determined by the method of chemical difference with the aid of a computer program. The O(1D) atom possesses translational energy in excess of that obtained from thermal equilibrium.

29553 **APTIC NO. 51719**

Mayrsohn, Henry and Frank Bonamassa

THE HYDROCARBON COMPOSITION OF LOS ANGELES MARKETED LOW-LEAD AND NO-LEAD GASOLINES. *Am. Chem. Soc., Div. Petrol. Chem., Preprints, 16(2):E113, 1971. (Presented at the American Chemical Society, National Meeting, 161st, Division of Petroleum Chemistry, Los Angeles, Calif. March 28-April 2, 1971.) (Complete text not available.)*

Extensive hydrocarbon analyses of various grades of gasoline of major distributors in the Los Angeles area were performed. Analyses were performed via temperature programmed, Golay column instruments where major components through C10 were identified and compared. These current fuels were compared with composite premium and regular gasolines marketed during 1969, and hydrocarbon changes were noted. (Author abstract modified)

29554 **APTIC NO. 51439**

Westenberg, A. A.

KINETICS OF NO AND CO IN LEAN, PREMIXED HYDROCARBON-AIR FLAMES. *Combust. Sci. Technol., 4(2):59-64, Oct. 1971. 14 refs.*

The kinetics of nitric oxide formation and carbon monoxide conversion in lean, premixed, hydrocarbon-air flames were studied in terms of the elmentary reactions involved. With assumptions of constant temperature and equilibrium oxygen and hydroxide radical concentrations, simple analytical solutions for NO and CO were derived as a function of time. Under conditions appropriate to a gas turbine combustor, and for an inlet temperature below 600 K and equivalence ratio below 0.6, 0.1-1 sec was available for quenching the NO formation by mixing in air. All CO should then be essentially converted to carbon dioxide in 5 msec or less. (Author abstract modified)

1969

29555 **APTIC NO. 51642**

Mohnen, V. A. and J. P. Lodge, Jr.

GENERAL REVIEW AND SURVEY OF GAS-TO-PARTICLE CONVERSIONS. *p. 69-91, 1969 (?). 123 refs.*

The problems of gas to particle conversions feasible for trace gas detection are discussed. A definite base from which to defend the need for such a program is provided to help other interested people working in similar or related fields. Basic processes responsible for the conversion process are discussed such as condensation, chemical interaction in the gas phase, combustion, photolysis, electric discharge chemistry, radiolysis, and ice crystal formation. Further research in radiation induced formation of condensation nuclei in outside air and the detection of trace gases with gas to particle conversion techniques are outlined.

1964

29556 **APTIC NO. 51049**

Beyer, K. D. and K. H. Welge

PHOTODISSOCIATION OF H2, N2, O2, NO, CO, H2O, CO2, and NH3 IN THE EXTREME VACUUM UV SPECTRUM. *(Photodissoziationen von H2, N2, O2, NO, CO, H2O, CO2, und NH3 im extramen Vakuum-UV). Z. Naturforsch., 19a(1):19-28, 1964. 31 refs. Translated from German. Translation Consultants, Ltd., Arlington, Va., NASA-TT-F-13,864, 18p., July 1971.*

NTIS: N72 14148

Photodissociations in the extreme vacuum, ultraviolet region which produce particles with energies of excitation over 8 eV, were verified through fluorescence experiments in the Schuman UV region between 1500 and 1100 A. The fluorescent intensities were measured as a function of the radiated wavelengths between 1000 and 645 A. Irradiation of hydrogen, oxygen, nitric oxide, water, carbon dioxide, and ammonia produces highly excited H, O, and N atoms, CO, and probably H2 molecules. In some cases, the types of dissociation can be determined from the fluorescent intensity as a function of radiated wavelength. The lack of fluorescence in N2, CO, N2O is important for measurement technology since this shows that the fluorescence established for the other molecules are not contaminated by light with a longer wavelength, which could have entered the fluorescence chamber and impinged on the multiplier cathode as scattered radiation.

EFFECTS-HUMAN HEALTH

1973

29557 **APTIC NO. 51308**

Council for the Living Environment (Japan)

DATA FOR THE ESTABLISHMENT OF THE MAXIMUM ALLOWABLE STANDARD FOR SUSPENDED PARTICULATES IN THE ENVIRONMENT. (JUNE 1971). *(Fuyu ryushijo busshitsu ni yoru taiki osen no kankyo kijun settei no tame no shiryo). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 8(1):1-76, April 1973. 38 refs.*

The general condition in Japan of air pollution by suspended particulates, and the work by the national measuring network are discussed. Digital counter measurements in various parts of Japan are presented in tables and graphs. The effects of suspended particulates on bronchitis morbidity among district office workers of the Tokyo Metropolitan Government are as follows: in lightly polluted areas, 3.9% for males, 3.0% for females; in medium polluted areas, 4.5% for males and 2.4% for females; and in highly polluted areas, 6.9% for males and 3.4% for females. Various other reports are given on the Japanese American cooperative research projects on the effects of suspended particulates on human health. Air pollution and mortality, aerosol deposit in the respiratory passage, epidemiological effects of suspended particulates, the effects of various mists on the human body, the effects of suspended particulates on animals, air pollution episodes, the environmental standards for suspended particulates in various countries, and the measurement methods for suspended particulates are thoroughly discussed. Some of the findings are: the concentration of suspended particulates of 600 micrograms/cu m reduces the visibility to less than 2 km, and general physical discomfort and worsening of illness are noted in the area. In areas with a yearly average (24-hour average) of 100 micrograms/cu m, morbidity of chronic respiratory diseases rises significantly; in such areas, the respiratory resistance of school children is higher than other areas. When the 24-hour average rises above 150 micrograms/cu m, or the 1-hour average above 300 micrograms/cu m, the mortality of sick people and old people definitely increases.

29558 **APTIC NO. 51670**

Japan Environment Agency, Bureau of Air Quality

PHOTOCHEMICAL AIR POLLUTION. *(Kokagaku hanno ni yoru taiki osen). Text in Japanese. 228p., Feb. 1973. 20 refs.*

The research reports and the governmental acts on photochemical air pollution in Japan are summarized and discussed in comparison with the case of Los Angeles. About 17,887 people complained of eye and throat irritation, or of violent coughing which are thought to be caused by photochemical smog in 1970; 48,118 people in 1971; and 21,245 people in 1972. Ninety percent of those who reported their sufferings in 1972 were primary and high school pupils. The report concentrated on the summer, especially in June. The formation of photochemical smog relates highly to the weather condition. Reports of eight individual cases are cited in detail. Research on the effects of the photochemical air pollution on life are also reviewed. Changes in the lung tissues and liver function of animals are induced by exposure to the photochemical smog which contains more than 0.5 ppm oxidants. The peak concentration of 0.1 ppm of oxidants is sufficient to irritate human eyes. Eye irritation is caused by formaldehyde and peroxybenzoyl nitrate, but not by ozone. Effects on sensitive plants are observed after exposing them in the atmosphere with 0.05 ppm of oxidants for 4 hr.

29559 **APTIC NO. 51164**

Akatsuka, Keiji

TETRAALKYL LEAD POISONING. *(Yonarukiruen chudoku). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), 15(1):3-66, Jan. 1973. 70 refs. (Presented at the Japan Association of Industrial Health, Kanto District Meeting, 82nd, Nov. 15, 1969.)*

The toxicity of tetraethyl lead was investigated with respect to its manufacture, occupational hazards, chemistry, effects on humans, including symptoms, pathology, diagnosis, treatment, and experimental results, and emission control. The toxicity differs depending on the mode of absorption, the purity of the pollutant, and the species, maturity, and metabolism of the victim. With respect to humans, the symptoms included insomnia, anorexia, dullness, dizziness, headache, memory deficiency, throat constriction, chest pains, and tremors. The major effects of TEL, therefore, are on the circulatory and nervous systems.

29560 **APTIC NO. 51411**

Alarie, Yves

SENSORY IRRITATION OF THE UPPER AIRWAYS BY AIRBORNE CHEMICALS. *Toxicol. Appl. Pharmacol., 24(2):279-297, Feb. 1973. 32 refs.*

Twenty-seven chemicals, some related to styrene with substitution on beta carbon and on the benzene ring, to betanitrostyrene with substitution on the benzene ring, to benzalmalononitrile with substitution on the benzene ring, and to cinnamalmalononitrile with substitution on the benzene ring, were tested for their potential sensory irritation properties to the upper respiratory tract when administered in an aerosol form to mice. The experimental methods, evaluation of the degree of irritation, and data analysis procedures are described. An analytical model for the data is suggested for comparison of the activity of these compounds. The essential molecular features for sensory irritant activity in these compounds are delineated. Correlation between the biological and chemical reactivity data suggested that these compounds initiate the sensory irritation reaction by associating with SH groups of a receptor molecule on the free nerve endings of the afferent trigeminal which are located at the surface of the nasal mucosa. (Author abstract)

29561 **APTIC NO. 51533**

Albert, Roy E., Morton Lippmann, Harold T. Peterson, Jr., Jack Berger, Kevin Sanborn, and Daryl Bohning

BRONCHIAL DEPOSITION AND CLEARANCE OF AEROSOLS. *Arch. Internal Med., 131(1):115-127, Jan. 1973. 22 refs.*

The regional deposition and mucocilliary clearance kinetics of inhaled particles were measured following the retention of inert gamma-emitting monodisperse test aerosols. A quantitative assessment was made of intersubject variability and intrasubject reproducibility. Reports on the effects of acute cigarette smoke exposure, abstinence from cigarettes in smokers, and of injected methacholine on particle deposition and clearance are presented. The deposition and clearance experimental methods are described, and results of tests of the characteristics of deposition and clearance in humans and the effects of methacholine on deposition and clearance in donkeys are discussed. Retention of particles in the lungs and tracheas of donkeys is discussed. The results of all tests were integrated with results from previous studies into a tentative schema for the pathogenesis of chronic bronchitis. (Author abstract modified)

29562 **APTIC NO. 51389**

Baikov, B. K., M. I. Gusev, Yu. V. Novikov, and T. V. Yudina

SOME EXPERIMENTAL DATA ON THE STUDY OF THE BIOLOGICAL ACTION OF BUTYL ALCOHOL AS AN ATMOSPHERIC POLLUTANT. *(Nekotoryye eksperimentalnyye dannyye po izucheniyu biologicheskogo deystviya butilovogo spirta kak atmosfernogo zagryaznitelya). Text in Russian. Gigiena i Sanit., no. 2:13-17, Feb. 1973. 5 refs.*

29563 **APTIC NO. 51158**

Chaube, Shakuntala, Hideo Nishimura, and Chester A. Swinyard

ZINC AND CADMIUM IN THE NORMAL HUMAN EMBRYOS AND FETUSES. ANALYSES BY ATOMIC ABSORPTION SPECTROMETRY. *Arch. Environ. Health, 26(5):237-246, May 1973. 46 refs.*

Zinc and cadmium concentrations were determined in 36 first trimester intact human embryos, and in the liver, brain, and kidneys of 14 second and 1 third trimester fetuses. Zinc was found in all first trimester specimens. It increased sevenfold between the 31st and 35th day of gestation. Cadmium was present in 57% of the specimens in concentrations from 0.032 micrograms/g to 0.07 micrograms/g of wet tissue. In second trimester specimens, mean zinc concentration in the brain was 5.6 micrograms, in the kidneys 15.7 micrograms, and in the liver 167.7 micrograms. Cadmium was present in 80% of the livers (mean, 0.113 micrograms/g), 28% of the kidneys (mean, 0.05 micrograms/g), and in 17% of the brain specimens (mean, 0.140 micrograms/g). Preparation of the specimens for analysis, and the atomic absorption spectrophotometric method used to quantitate zinc and cadmium were described. The mothers of these abortuses did not live in areas of Japan where endemic cadmium poisoning exists; however, the higher cadmium content of the average Japanese diet may be reflected by the cadmium concentrations in these specimens. (Author abstract modified)

29564 **APTIC NO. 51559**

Chickin, S. Ya., B. A. Somov, and G. D. Zhitnitskiy

SOME OBJECTIVES IN THE SCIENTIFIC APPROACH TO THE PROBLEM OF ATMOSPHERIC POLLUTION AND ITS EFFECT ON SANITARY AND LIVING CONDITIONS AND ON PUBLIC HEALTH IN THE RSFSR. *(Nekotoryye zadachi nauchnoy razrabotki problemy zagryazneniya atmosfernogo vozdukha i ikh vliyaniye na sanitarno-bytovyye usloviya i zdorovye naseleniya v RSFSR). Text in Russian. Gigiena i Sanit., no. 4:52-55, 1973.*

A scientific research program, conducted in the RSFSR in the air pollution area, is surveyed. Possibilities of human adaptation to environmental pollution, and long-term effects of air pollutants on genetic, reproductive, and other functions of the human organism are discussed. Hygienic assessments of air pollutants in industrial agglomerations, including petroleum refineries, have been conducted. Effects of small concentrations of toxic substances on the organism are being studied in view to the determination of maximum allowable concentrations of toxic substances in the air and of their combinations. Over 4000 gas and dust separators have been put into operation in the 1968 1970 period.

29565 **APTIC NO. 51147**

Cohen, David

FERROMAGNETIC CONTAMINATION IN THE LUNGS AND OTHER ORGANS OF THE HUMAN BODY.

Science, 180(4087):745-748, May 18, 1973. 18 refs.

Contaminating particles which are ferromagnetic were found in the human body. Their distribution was measured by applying an external magnetic field to the torso for a short time, and then, in a shielded room, mapping the steady magnetic field around the torso due to the magnetized particles. Maps of subjects showed various distributions, including particles in the stomach from food cans, and in the lungs from arc welding. The fields from these two sources were strong enough to be detected with a flux-gate magnetometer, without the need of a shielded room. The simplicity of detecting larger amounts of ferromagnetic contamination suggests that this method may be used in two applications: in detecting the presence of large amounts of asbestos (ferromagnetic and harmful) in the lungs of asbestos workers, and in tests of the condition of the lung where black iron oxide dust (ferromagnetic and harmless) would be used as an inhaled tracer material. (Author abstract)

29566 **APTIC NO. 51548**

Davydova, T. B.

THE EFFECT OF INHALED TETRAMETHYLTHIURAM DISULFIDE ON THE ESTROCYCLE AND REPRODUCTIVE FUNCTION IN ANIMALS.

(Vliyaniye tetrametiltiuramdisulfida na estralnyy tsikl i detorodnuyu funktsiyu zhivotnykh pri ingalyatsionnom vozdeystvii). Text in Russian. Gigiena i Sanit., no. 4:108-110, 1973. 3 refs.

Changes in the estrocycle and reproductive functions of female albino rats due to inhalation for 6 hr/day, five days/week over 4.5 mo of tetramethylthiuramdisulfide concentrations of 3.8 or 0.45 mg/cu m were studied. Prolongation of the estrocycle, especially due to a concentration of 3.8 mg/cu m, during the initial period of the experiment, followed by normalization of the estrocycle by the end of the poisoning assay, was determined. Significant decrease in the leucocyte count and increase in the rod neutrophil count were observed. Significant decreases in the rates of conception, fertility, live birth, and in the embryonal weight were noted. Tetramethylthiuramdisulfide was generally toxic in albino rats.

29567 **APTIC NO. 51408**

Ehato, Toshiya

PATHOLOGICAL OBSERVATIONS OF THE LUNGS OF CITY INHABITANTS. (2).

(Toshi ni seikatsu shiteiru mono no hai no byorigakuteki shoken). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 11:10, 1973.

The 312 autopsied lungs at Hiroo Hospital and the Tokyo University Hospital were studied during the past 12 years to see the effects of air pollution on the lungs of city inhabitants. Of the 165 males and 147 females, 87 were less than 40 years of age, 41 in their 40s, 60 in their 50s, 66 in their 60s, and 58 between 70 and 80. Anthracosis, chronic bronchitis, and lung cancers were studied. There were 101 cases of anthracosis, which increased in number with the age; cases among males were significantly more than those among females. Anthracosis developed most frequently around the lung arteries, and characteristic granulomas were on the alveolar walls for those above 40 years of age. The geographical studies showed a definite relationship between anthracosis morbidity and the amount of settling particles. There were 99 cases of chronic bronchitis, and no difference caused by sex. Forty-eight cases occurred in the last 3 years. There was no significant relationship with smoking. Chronic bronchitis seemed to have only a limited relationship with the amount of settling particles and smoking, and occurred in a large urban environment. An increase of morbidity in the future is anticipated. There were 27 lung cancer cases, with a higher morbidity among the aged. There was a significant relationship with smoking for those smokers with more than 20 cigarettes a day. There was a significant recent increase of limited or diffused interstitial pneumonia or pulmonary fibrosis, mostly caused by arteriole impairment. The presence is suspected of pollutants in the environment that damage blood vessels.

29568 **APTIC NO. 51290**

Ehrenreich, Theodore, Anne D. Mackler, Arthur M. Langer, and Irving J. Selikoff

IDENTIFICATION AND CHARACTERIZATION OF PULMONARY DUST BURDEN IN PNEUMOCONIOSIS.

Ann. Clin. Lab. Sci., 3(2):118-131, March/April 1973. 25 refs.

The identification and characterization of dusts identified with pneumoconiosis were studied with respect to types of dusts, types of exposure, diagnosis through examination of tissues, and their toxic mechanism in the respiratory tract. The major agents of pneumoconiosis, inhaled through direct or indirect occupational exposure or as atmospheric pollutants and identified as causes of asbestosis, lung carcinoma, and silicosis, include inorganic dusts of silica, quartz, silicates, asbestos, talc, clays, and hard metal minerals, e.g., sulfides, arsenides, and tellurides, and organic dusts of cotton, grains, detergent enzymes, brewing enzymes, and fibrous residue of sugar cane. The measurement methods for the determination of pulmonary dust burdens include light microscopy, X-ray diffraction, electron beam instruments, infrared spectroscopy, thermal analysis, emission spectroscopy, X-ray fluorescence, atomic absorption spectroscopy, and wet chemical analysis.

29569 **APTIC NO. 51595**

Freeman, Gustave, Robert J. Stephens, David L. Coffin, and Jerry F. Stara

CHANGES IN DOGS LUNGS AFTER LONG-TERM EXPOSURE TO OZONE.

Arch. Environ. Health, 26(4):209-216, April 1973. 18 refs.

Dogs were exposed to 1-3 ppm of ozone for 8-24 hours daily for 18 mo to study the changes in their lungs. Macrophages appeared and increased with dosage; fibrous elements were rarely deposited at the lowest dosage but also increased with O3 concentration. Additional changes included thickening of the terminal and respiratory bronchiolar walls at the higher concentrations and their infiltration by lymphocytes, plasma cells, and fibroblasts. Connective tissue obstructed alveolar openings into bronchioles and ducts and extended into alveolar walls. Thick bronchiolar walls reduced the caliber of small airways. Bronchiolar epithelial changes included an increase in the proportion of mucus-forming cells and squamous metaplasia of columnar and cuboidal cells with occasional islands of hyperplasia. Metabolic effects were reflected in ultrastructural alteration of preexisting intracytoplasmic bodies. (Author abstract modified)

29570 **APTIC NO. 51369**

Gibbons, Geoffrey F. and Konstantinos A. Mitropoulos

THE EFFECT OF CARBON MONOXIDE ON THE NATURE OF THE ACCUMULATED 4,4-DIMETHYL STEROL PRECURSORS OF CHOLESTEROL DURING

ITS BIOSYNTHESIS FROM (2-14C)MEVALONIC ACID IN VITRO. *Biochem. J., 132(3):439-448, March 1973. 23 refs.*

Cholesterol biosynthesis was studied in rat liver subcellular fractions incubated with DL-(2-14C)mevalonic acid under gas phases consisting of either nitrogen and oxygen (90:10) or carbon monoxide and oxygen(90:10). Carbon monoxide inhibits cholesterol biosynthesis from (2-14C)mevalonic acid and results in a large accumulation of radioactive 4,4-dimethyl sterols. Separation of the components of the 4,4-dimethyl sterol fraction showed that lanosterol and dihydrolanosterol are the major components that accumulate during cholesterol biosynthesis in an atmosphere containing CO, whereas 14-dimethyl-lanosterol and 14-dimethyldihydrolanosterol are the major components of the 4,4-dimethyl sterol fraction isolated from incubations with nitrogen and oxygen as the gas phase. The identities of lanosterol, dihydrolanosterol, and 14-dimethyldihydrolanosterol were confirmed by both radiochemical and physicochemical methods, including mass spectrometry. Carbon monoxide thus results in a qualitative and a quantitative difference in the 4,4-dimethyl sterol fraction. The specific radioactivity of the (14C)lanosterol biosynthesized in the presence of CO was lower than that of its companion, (14C)dihydrolanosterol. Enzymic reduction of the sterol side chain occurs predominantly at a stage after that of lanosterol. (Author abstract modified)

29571 **APTIC NO. 51427**

Goldberg, Irwin S. and Ruy V. Lourenco

DEPOSITION OF AEROSOLS IN PULMONARY DISEASE. *Arch. Internal Med., 131(1):88-91, Jan. 1973. 17 refs.*

The possible effects of pathological conditions upon particle deposition in the lungs are discussed. Pathological conditions may possibly affect the deposition of aerosols in the human respiratory tract. Respiratory disease causes alterations in the pattern of breathing and changes in airway diameter and geometry. These alterations influence the main mechanisms of deposition such as inertial impaction, gravitational sedimentation, brownian diffusion, and turbulent diffusion.

29572 **APTIC NO. 51152**

Goldstein, Bernard D.

HYDROGEN PEROXIDE IN ERYTHROCYTES. DETECTION IN RATS AND MICE INHALING OZONE. *Arch. Environ. Health, 26(5):279-280, May 1973. 18 refs.*

Evidence is presented indicating that inhalation of ozone results in the formation of hydrogen peroxide, and that ozone-induced hydrogen peroxide is detectable within the circulating erythrocytes of rats and mice. Rats were exposed to 5.0 ppm ozone and mice were exposed to 6.7 ppm ozone for 90 min, resulting in a significant decline in erythrocyte catalase levels in the animals pretreated with the catalase inhibitor, aminotriazole (ATZ). The ATZ inhibited catalase only after the enzyme had first reacted with hydrogen peroxide. This decline in catalase activity indicated the presence of hydrogen peroxide within erythrocytes during ozone inhalation. Exposure to lower levels of ozone did not produce detectable levels of hydrogen peroxide in the erythrocytes. The methods used in the study are described. In vitro evaluation of the technique suggested that, as in humans, catalase is not the major enzyme detoxifying hydrogen peroxide in rat erythrocytes. The ATZ-catalase method is limited in its ability to detect the ozone-induced presence of hydrogen peroxide beyond the pulmonary endothelium. (Author abstract modified)

29573 **APTIC NO. 51598**

Goldstein, Elliot, M. Carroll Eagle, and Paul D. Hoeprich

EFFECT OF NITROGEN DIOXIDE ON PULMONARY BACTERIAL DEFENSE MECHANISMS. *Arch. Environ. Health, 26(4):202-204, April 1973. 22 refs.*

The effect of nitrogen dioxide on antibacterial activity in vivo was investigated by simultaneously determining physical removal and bactericidal activity rates of murine lung. Mice were exposed to various concentrations of NO2 for 17 hours prior to or 4 hours after infection with aerosols of Staphylococcus aureus. Animals infected and then exposed to levels of NO2 above 7.0 ppm showed a progressive decrease in percent pulmonary bactericidal activity which could not be accounted for by physical removal of the bacteria. Exposure to NO2 levels of 2.3 ppm or greater for 17 hours prior to bacterial infection caused decreases in bactericidal activity. (Author abstract modified)

29574 **APTIC NO. 51706**

Gothe, Carl-Johan, Harry Oehman, and Goesta Lindstedt

EXPOSURE TO AIRBORNE LEAD IN CITY ATMOSPHERE. *Work Environ. Health, vol. 10:13-18, 1973. 24 refs.*

Airborne lead was collected in five frequented intersections in the central parts of Stockholm, and in an office room just outside the city center. The lead concentration was five to six times higher outdoors than indoors, while the amount of airborne dust was about the same. The lead content of blood was studied in policemen and their wives, and in female traffic wardens and their husbands. The lead content was, throughout, somewhat lower in the females than in the males. However, there were no significant differences between policemen s wives and the traffic wardens, or between the policemen and the husbands of the traffic wardens. Men with outdoor work had somewhat higher lead content in blood than men with indoor work, indicating that exposure to an outdoor atmosphere contaminated with exhaust gas can increase the average lead concentration in blood to a low, but significant, degree. (Author abstract)

29575 **APTIC NO. 51335**

Hashimoto, Kazuo and Mitsuo Takahashi

DAMAGE ON PERIPHERAL NERVES AFTER A LONG PERIOD OF POLYSTYRENE COMBUSTION OPERATION. *(Chokikan no porischiren shokyaku sagyogo ni mirareta massho shinkei shogai no ichishorei). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 422-423, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 529.)*

A worker who was engaged in the incineration of waste polystyrene between Feb. and Oct. 1971 began to feel strong discomfort of the gum, palms of the hands, and numbness of the soles. He also felt tick like movements of the muscles in the chest, difficulty in climbing stairs, and the deterioration of vision. Clinical examinations revealed no internal disorders, but the toxicity of combustion gases, especially of styrene monomer, was strongly suspected as the cause of damage to peripheral nerves. Other cases of complaints of irritation of mucous membranes, and damage to livers and the nervous systems caused by the styrene monomer have been reported recently. Some of the leg muscles lost reflexes and the rheotachygraphy results suggested damage to various peripheral nerves. As of Jan. 1973, the patient s muscle reflexes were restored, but his conscious symptoms were still present. He was engaged in the operation of throwing approximately 60 kg of polystyrene waste daily into the incinerator, in samll bundles, every 10 min. Each time he threw in a waste bundle, he inhaled the smoke with a strong odor. He also smelled the strong odor when he took ashes from the ash bunker. An incineration test using the same incinerator indicated that the monomer concentration at the chute was 100-50 ppm.

29576 **APTIC NO. 51184**

Henry, Y. and R. Cassoly

CHAIN NON-EQUIVALENCE IN NITRIC OXIDE BINDING TO HEMOGLOBIN. *Biochem. Biophys. Res. Comm., 51(3):659-665, April 2, 1973. 11 refs.*

The ratio of the apparent rates of ligand binding to the alpha and beta subunits of human hemoglobin on mixing with nonsaturating amounts of nitric oxide was measured. Electron spin resonance measurements directly determined the ratio of the amounts of the respective chains bound by NO. In stopped-flow kinetics measurements, the known difference in the kinetic constants of the alpha and beta chains in hemoglobin in the reaction with n-butyl isocyanide was used. The apparent association rate constant of NO was greater for the alpha than for the beta chain. (Author summary modified)

29577 **APTIC NO. 51293**

Honma, Katsunori

THE LUNG DEPOSITION OF IRREGULAR SHAPED HEAVY METAL FUMES. *(Fuseikei jukinzoku hyumu no hainai chinchaku). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 184-185, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 303.)*

Heavy metal fume deposition rates in the lung and the upper respiratory tract were examined using irregular-shaped antimony particles and rats. The rats inhaled Sb fume in an exposure chamber for 90 min, where the fume was supplied through an Andersen sampler connected with an aerosol producer. Atomic absorption spectrophotometry was used for analyzing the deposits in the dissected lungs and upper respiratory tract. The relative deposit rate showed a clear inverse relationship with aerodynamic diameters, and the effect of the particle diameters was clearly noted. The deposit in the upper respiratory tract was relatively great, as much as 10% of small particles and 4.5% of 1-micron particles. The deposit index which determines the deposit rate depends on the type of material. For instance, the index of Sb (1.2) is approximately double that of lead, and four times greater than that of tellurium. The fact that multi-dispersion aerosol has a larger rate of coagulation compared to single dispersion aerosol might have caused the greater deposit in the upper respiratory area. The type of aerosol having greater solubility or a greater affinity with steam may also be a controlling factor for the deposit rate of pollutants.

29578 **APTIC NO. 51381**

Inoue, Reiko, E. Okamoto, T. Hirayama, and K. Sugita

LUNG CANCER AND AIR POLLUTION. *(Haigan to taiki osen). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(4):207-213, April 1973. 18 refs.*

Lung cancer death rates were studied in Kawasaki, Yokohama, Kamakura, Zushi, Yokosuka, Miura, Fujisawa, and Hayama in Kanagawa Prefecture. The lung cancer mortality rate was higher in Miura, Kawasaki, and Yokohama than in the other cities. Men had more lung cancer than women. Lung cancer mortality was statistically correlated to sulfur oxides and dust fall concentrations in Kawasaki, Yokohama, and Yokosuka. Lung cancer mortality increased as pollution increased.

29579 **APTIC NO. 51130**

Ishida, Takayuki

STUDIES ON THE RELATIONSHIP BETWEEN AIR POLLUTION AND CHILDREN S BRONCHIAL ASTHMA (REPORT NO. 4). *Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 4:253-254, March 31, 1973.*

In order to study the surface activity of the lungs, third graders and sixth graders were given examinations on their vital capacity, 1-second measurement, 1-second rate, peak flow rate, and inhalation resistance. The surface tension and surface activity of the lungs were examined by sampling the bronchial rinsing water of hospitalized children. The tension curves were taken by the Wilhelmy Balance; and when the curve stabilized, the maximum and minimum surface tensions were measured and then the samplings were given a phospholipid analysis. The second-rate for both the third graders and the sixth graders were within the area of 85-90%, and slightly lower than the second-rate of 90% which is considered normal for the age group. The air resistance ranged from 2.3 to 7.0, majority in the area of 3.0 to 4.0. The peak flow rate and the air resistance both suggested some effect of air pollution. The minimum surface tension of the children showed clearly a higher index than that of animal experiments. Further studies must be conducted for a definite conclusion of the analysis of bronchial rinsing water.

29580 **APTIC NO. 51303**

Jakab, George J. and Gareth M. Green

EFFECTS OF PNEUMONIA ON INTRAPULMONARY DISTRIBUTION OF INHALED PARTICLES. *Am. Rev. Respirat. Disease, 107(4):675-678, April 1973. 2 refs.*

The effect of pre-existing lung disease on pulmonary deposition of inhaled particulates was studied in a mouse pneumonia model. Radiolabeled bacteria were introduced by aerosol into mice previously infected with Sendai virus. Equal volumes of consolidated and nonconsolidated areas of the lung were removed and assayed for the quantity of deposited particles. Of all the aerosolized bacterial particles, 90% were deposited in the nonconsolidated areas, and 10% were deposited in the consolidated areas. (Author summary modified)

29581 **APTIC NO. 51436**

Kanapilly, G. M., O. G. Raabe, C. H. T. Goh, and R. A. Chimenti

MEASUREMENT OF IN VITRO DISSOLUTION OF AEROSOL PARTICLES FOR COMPARISON TO IN VIVO DISSOLUTION IN THE LOWER RESPIRATORY TRACT AFTER INHALATION. *Health Phys., vol. 24:497-507, May 1973. 31 refs.*

Dissolution and transport of particles deposited in the lower respiratory tract (LRT) are important factors when estimating clearance and the long-term hazard associated with inhaled radioactive aerosols. Three methods for the in vitro determination of rates of dissolution in simulated biological fluids of respirable particles are described. Short term in vitro dissolution patterns of 144 cerium chloride aerosol particles and various samples of 95 zirconium-95 niobium aerosol particles were determined and compared with data on the in vivo dissolution of similar particles in the lower respiratory tract of experimental animals. General agreement between the in vitro and in vivo dissolution patterns was observed. The long-term in vitro rates of dissolution of narrow size group 90 strontium-fused clay particles in the two systems were calculated. The estimated rate constant of dissolution of 90 strontium-fused clay particles in the lower respiratory tract of a dog was in good agreement with the in vitro rate constant of dissolution. (Author abstract)

29582 **APTIC NO. 51338**

Kawai, Kiyoyuki, Koyu Nozaki, Kazuo Fukuda, and Yoshimi Matsumura

EXPERIMENTS ON THE INHALATION OF COMBUSTION PRODUCTS, REPORT NO. 4: PATHOPHYSICAL OBSERVATIONS. *(Juyu nensho seiseibutsu kyunyu jikken, daiyonpo: byorigakuteki shoken). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 162-163, 1973. (Presented st the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 237.)*

Four groups of rats were exposed to fuel oil combustion products of various concentrations. One group was exposed to flue gas with an average of 6670 micrograms/cu m particles, 16.27 ppm sulfur dioxide, 36.90 ppm carbon monoxide, and 3.64 ppm nitrogen oxide. Another group was exposed to filtered flue gas with an average of 14.70 micrograms/cu m particles, 10.13 ppm SO_2, 25.63 ppm CO, and 2.68 ppm NO_x. The third group was exposed to a low concentration gas with an average of 471 micrograms/cu m particles, 2.41 ppm SO2, 9.89 ppm CO, and 0.69 ppm NOx. The control group was exposed to a clean air filtered through an activated carbon layer. All of the exposed groups died before the 900th day. The basic cause for death before the 700th day in both control and exposure groups were tumors in the pituitary gland which bled. After 700 days, idiopathic nephritis, fibrosis of the heart, hardening of the artery, and muscle degeneration developed. The group exposed to filtered combustion gas also developed fibrosis of the heart. There was no clear pattern among the survivors of various exposure groups. The basic type of lung symptom was chronic bronchiolitis, which was not recognized in the groups exposed to filtered gas or air. Since most of the causes of deaths before the 900th day were due to aging of the rats, in a long-term inhalation experiment, it was necessary to treat the animals for those diseases caused by reasons other than pollutants.

29583 **APTIC NO. 51354**

Kazantzis, G.

METAL CONTAMINANTS IN THE ENVIRONMENT. *Practitioner, 210(1258):482-489, April 1973. 16 refs.*

The toxic potential of mercury, lead, and cadmium as environmental pollutants is reviewed with respect to data on their toxic action as observed in specifically exposed industrial groups. Cases of occupational poisoning, pollutant sources, and types of exposure are examined. The symptoms of mercury poisoning, observed among groups exposed to poisoned water and food, centered on the central nervous system. Cadmium poisoning was characterized by damage to both lung and kidney, including dyspnoea, pulmonary emphysema, pulmonary edema, proteinuria, and necrosis, and bone damage, e.g., the itai-itai disease. The symptoms of lead poisoning included anemia and various metabolic changes. Some preventive measures are reviewed.

29584 **APTIC NO. 51292**

Kitamura, Shoji, Kiyoko Hayakawa, and Takako Shibata

THE ABSORPTION, EXCRETION, AND TOXICITY OF ANTIMONY. *(Anchimon (Sb) no kyushu, haisetsu narabini dokusei ni tsuite). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 180-181, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 301.)*

The toxicity of antimony, and the absorption rate, excretion rate, and accumulation rate of the host were examined using mice. Both oral administration and injection of 100 microgram Sb were used. The biological half-life, weight changes, residues in the organs, and the pathological changes in the organs were examined. The Sb residues were determined by colorimetry after the burning of organs and hair by nitric acid and perchloric acid. The peak accumulation in the entire body appeared 6 hr after the oral administration in the amount of approximately 10% or less, and the residue gradually decreased after that. The residue in the digestive system drastically decreased after 6 hr. The absorption of Sb by the body was low and excretion was rather rapid. The biological half-life was 30 hr. Approximately double the amount of LD 50 for rats were continuously administered to mice, but no deaths occurred. No effects on the weight or organs appeared; there was no difference between males and females. Slightly higher residue was noted in the lungs, kidneys, and skin, but the differences were all less than 0.5 ppm.

29585 **APTIC NO. 51334**

Kobayashi, Yoshitaka, Yoshitaka Sugiyama, Shunichi Ushigome, Yoshihide Niitani, Susumu Sarai, and Akihiro Ochiai

THE EFFECTS OF EXPOSURE TO TRACEABLE MANGANESE ON THE HUMAN BODY -- INDUSTRIAL HYGIENIC STUDIES ON MANGANESE POISONING (2). *(Biryo mangan bakuro ni yoru jintai eikyo ni tsuite-- Mangan chudoku ni kansuru rodo eiseigakuteki kenkyu). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 190-191, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 306.)*

Forty-one workers in the manganese railing manufacturing process were examined to see the effects of traceable manganese dusts on their health. Their medical histories, conscious symptoms, chest X-rays, manganese excretion in urine, and other nervous and physiological symptoms were examined. Air samplings were taken by a hi-volume sampler, particle size was measured by the Andersen air sampler, and the Mn content in dusts and urine was measured by atomic absorption spectrophotometry. The total amount of dusts in three areas were 9550, 4058, and 2834 mg/cu m, and the dust particle sizes were generally large (only 13.3% were less than 2 micron). The Mn content in dust was 0.963%; by individual samplers, Mn in dust was 1.467 mg/cu m. It was far below the maximum allowable concentration in the working environment which is 5 mg/cu m. The workers average age was 43.2 years, average duration of work in the same environment was 15.6 years, and 65.9% were older than 40 years, and 75.6% had worked more than 10 years. The chest X-ray test revealed 12 workers (29.3%) with pneumoconiosis. They were all older than 40 years old and had worked more than 15 years in the same environment. Significant differences from the control group were noted in the complaints of hip pains (39.0%) and the average on the total number of complaints (12.6%). Other symptoms with high rates of complaints were sputum (41.5%), wheezing (7.3%), chest pain (9.8%), fatigue (29.3%), and pain in the joints (34.2%).

29586 **APTIC NO. 51664**

Koshi, Kimiko and Hiroyuki Sakabe

THE TOXICITY OF FUEL COMBUSTION PRODUCTS IN THE CELL. *(Juyu nensho seiseibutsu no saibo dokusei). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 164-165, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 238.)*

Soot from the combustion of grade B heavy oil was tested for its toxicity to animal cells. The quantities of soot directly sampled from the stack (S), dialyzed soot (DS), and the soot deposited on the heating surface of a boiler (BS) that hinder 50% of the incorporation of leucine-carbon(14) with intraperitoneal rat macrophages were 98, 480, and 2800 micrograms, respectively. The quantity to hinder 50% of the triphenyltetrazonium chloride reducing ability was more than 1000 micrograms for all three kinds of soot. One mg and 500 micrograms of S deteriorated the 3T6 fibroblast of a mouse embryo, and 250 and 125 micrograms of S hindered the incorporation of thymidine-hydrogen(3). Light hematolysis of red corpuscles was caused by S and DS soots.

29587 **APTIC NO. 51256**

Kosmider, St., A. Misiewicz, E. Felus, M. Drozdz, and K. Ludyga

EXPERIMENTAL AND CLINICAL STUDIES ON THE EFFECTS OF NITROGEN OXIDES ON IMMUNITY. *(Experimentelle und klinische Untersuchungen ueber den Einfluss der Stickstoffoxyde auf die Immunitaet). Text in German. Int. Arch. Arbeitsmed., 31(1):9-23, 1973. 30 refs.*

The effect of nitrogen oxides on immunity was examined in animal experiments and clinical trials. In guinea pigs, immunity decreased following a 6-month exposure to 1 ppm NOx and the incidence of respiratory infection increased. Reduced hemolytic activity of the complement was also determined. Mice infected with diplococcus pneumoniae and exposed to NOx had a higher mortality rate than the control group. The lowered immunity was due to impaired protein synthesis. Clinical examinations of patients suffering occupational exposure to NOx determined a depressed protein level, reduced levels of albumin and IgG globulins, and increased levels of IgA and IgM immunoglobulins.

29588 **APTIC NO. 51549**

Kurlyandskiy, B. A. and L. L. Ordynskiy

ON METHODS FOR THE ASSESSMENT OF THE HAZARDS OF CHRONIC INHALATORY POISONINGS. *(K metodike otsenki opasnosti khronicheskogo ingalyatsionnogo otravleniya). Text in Russian. Gigiena i Sanit., no. 4:68-69, 1973. 3 refs.*

A mathematical method for the assessment of the hazards of chronic inhalatory poisoning is presented based on the assumption that any non-lethal inhalatory poisoning, when repeated, is capable of leading to chronic poisoning. Concentrations able to produce chronic poisoning are tentatively characterized by the respective ranges of acute, non-lethal inhalatory poisoning, and by the ranges of possible chronic inhalatory poisoning, with both ranges featuring a common starting point at CL5. The difference between the above ranges is proposed as a parameter of the chronic inhalatory poisoning hazard. Such poisoning hazard indices have been calculated for some 30 different chemical compounds. The indicies of chronic inhalatory poisoning hazards of freon, dicyclopentadiene, propylene oxide, furan, and ethyleneimine were determined to be 9.7, 18, 66.4, and 252. The chronic inhalatory poisoning hazards of various substances can be thus classed into the categories 0-10 (little hazard), 10-100 (hazardous), 100-1000 (very hazardous), and above 1000 (especially hazardous).

29589 **APTIC NO. 51189**

Lebowitz, Michael D.

A COMPARATIVE ANALYSIS OF THE STIMULUS-RESPONSE RELATIONSHIP BETWEEN MORTALITY AND AIR POLLUTION-WEATHER. *Environ. Res., 6(1):106-118, March 1973. 16 refs.*

The relationship between mortality and air pollution-weather was examined for New York, Philadelphia, and Los Angeles. The variables included mortality, by age group; daily measurements of sulfur dioxide, particulates, carbon monoxide, and nitrogen oxides; and data on temperature, relative humidity, wind speed, and solar radiation. Corrections were included for day-of-week and seasonal effects. Based on regression analysis, mortality was related in time to air pollution and weather; the stimulus response method was used to tabulate the relationship. (Author abstract modified)

29590 **APTIC NO. 51362**

Lippmann, M., H. L. Eckert, N. Hahon, and W. K. C. Morgan

THE PREVALENCE OF CIRCULATING ANTI-NUCLEAR AND RHEUMATOID FACTORS IN UNITED STATES COAL MINERS. *Preprint, American Coll. of Physicians, 10p., 1973. (Presented at the American College of Physicians, Annual Meeting, Chicago, Ill., April 12, 1973.)*

The prevalence of rheumatoid and antinuclear (ANA) factors in a selected population of U. S. coal miners was investigated. The miners were selected and grouped on the basis of radiographic tests into four categories: Caplans, progressive massive fibrosis, coal workers pneumoconiosis, and controls. Caplan s syndrome was an uncommon condition: only 1 subject out of over 4000 miners was diagnosed with the classical features of the condition. Only a small and insignificant proportion of miners with progressive massive fibrosis had rheumatoid factor in their serum. Miners with the nodular form of simple pneumoconiosis also showed no increased prevalence of rheumatoid factor. A substantial and significant proportion, however, had ANA in their serum.

29591 **APTIC NO. 51487**

Macklem, Peter T., William E. Hogg, and James Brunton

PERIPHERAL AIRWAY OBSTRUCTION AND PARTICULATE DEPOSITION IN THE LUNG. *Arch. Internal Med., 131(1):93-97, Jan. 1973. 7 refs.*

Peripheral airway obstruction and particulate deposition in the lung were studied. A model of airway obstruction was made; the experimental method using dog s lobes is described. If inhaled irritants lead to airway obstruction, the distribution of ventilation will be altered so that the inspired gas is diverted principally through unobstructed airways. Continued exposure to the irritant will thus establish a vicious in which the irritant will principally be distributed to the healthy airways. Radial diffusion of inspired gas wherever the velocity profile at the front between inspired and alveolar gas was other than blunt, enriched the fast moving central core with the particulates so that alveolar penetration was deeper than would otherwise be the case. (Author abstract modified)

29592 **APTIC NO. 51124**

Makino, Kuniyoshi

PHOTOCHEMICAL SMOGS AND CONSCIOUS SYMPTOMS. *(Kokagaku sumoggu to jikaku shojo). Text in Japanese. In: A Progress Report on Public Nuisance Researches, No. 2. Basic Medical Experiments Concerning Photochemical Smogs. Tokyo Metropolitan Government (Japan), Inst. of Hygiene, p. 42-46, March 1973.*

Approximately 850 children and students of kindergartens, elementary schools, and junior and senior high schools in the Meguro district of Tokyo were examined between July and October 1972. Their conscious symptoms were examined by questionnaires and classified into 17 categories. The measurements for oxidants, sulfur dioxide, nitrogen dioxide, suspended particulates, temperature, humidity, and daily sunshine were taken. In all categories but humidity, the maximum counts were used; the minimum daily index was used for humidity. The greatest number of symptoms were reported in July, followed by August, and approximately the same number of symptoms were reported in Sept. and Oct. Symptoms such as eye irritation, headache, cough, and throat pain were high in that order every month. Coughing especially had a relatively high average every month. But the stuffed nose complaints increased toward the fall and seemed to show the effects of the cold. Breathing difficulty seemed to be caused by oppressive weather, and lachrymation seemed to occur when eye irritation became serious. Symptoms such as eye irritation, strange odor, and headache were high when the daily maximum index for oxidant was over 0.1 ppm. Thus, oxidant concentration was closely related with the eye symptoms, and relatively closely related with the respiratory symptoms such as coughing and throat pain. Generally, girls were more susceptible to these symptoms than boys except for stuffed nose.

29593 **APTIC NO. 51404**

Mikami, Riichiro

CLINICAL STUDIES OF PHOTOCHEMICAL SMOG VICTIMS. (4). *(Iwayuru kokagaku sumoggu no rinsho). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 11:11, 1973.*

The effects of photochemical smogs were first recognized in 1970 in an environment with 0.3 ppm oxidant. The morphology and physiology of symptoms are not clear except for the irritation of the eye and the respiratory system. Clinical studies of smog incidents in 1972 showed several characteristics: victims appeared in an environment with relatively low oxidant concentration in some cases; compared to local symptoms such as membrane irritation, the rate of the total body symptoms was high; the most serious cases occurred during physical exercises such as running, or immediately afterward; some of those with the total body symptoms had some significant factors in the past record; total body symptoms had a tendency to be prolonged; in cases of group incidents, the symptoms were to some degree influenced by psychological factors.

29594 **APTIC NO. 51405**

Miyaji, Kazuma

TREATMENT OF AIR POLLUTION-CAUSED CHRONIC CONGESTIVE RESPIRATORY PATIENTS--CENTERING UPON SO-CALLED YOKKAICHI ASTHMA PATIENT. (5). *(Taiki osen ni yoru mansei heisokusei kokyuki shikkan no chiryo--iwayuru Yokkaichi zensoku o chushin to shite). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 11:11-12, 1973.*

Asthma cases in Yokkaichi show a relatively low relationship with the rate of reaction to housedust and genetic factors, and both are within 20-30%. There are increases of acidocyte hestamine in blood, serotonin, and IgE. Mortality between 1965 and 1971 was 58, and the relationship between cause of death and the original disease was 1% with asthmatic bronchitis, 3% with chronic bronchitis and asthma, and 40% with emphysema. These records show that the susceptibility of bronchi is increased in a polluted environment. In June 1965, 24 beds were installed in the newly constructed clean air ward. In this ward, the air is filtered through activated carbon which eliminates sulfur dioxide by 97%. Of the group that had been ill before the air pollution of Yokkaichi started (Group A) and another group that were hospitalized as a result of air pollution (Group B), no improvement was noted in Group A but in some cases symptoms worsened. Many improved in Group B with asthma, chronic bronchitis, and emphysema. After 2-3 years, no improvement was recognized in asthmatic cases of Group A. In group B, effects were noted in the first year in the clean air ward, but not much effect after that. The early stages of diseases developed by pollution could be reversed by removing the patients from the polluted environment for about a year. Abuse of aminophylline steroid, which is often abused by athmatic patients for expansion of bronchi, can cause asthmatic death.

29595 **APTIC NO. 51127**

Miyamoto, Akimasa

IMMUNOLOGICAL STUDIES ON THE EFFECTS OF AIR POLLUTION. (REPORT NO. 1). *(Taiki osen no eikyo no menekigakuteki na kenkyu). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 4:251-252, March 31, 1973.*

Blood tests were given to 57 chronic congestive lung disease patients in Tokyo, 64 Kawasaki pollution victiims, and 205 normal healthy individuals to examine a hypothesis that lower alfa 1-antitrypsin in the blood causes susceptibility to the effects of air pollution. The gel precipitation reaction of alfa 1-antitrypsin to partigen was examined. The result showed that some of the Kawasaki patients had slightly lower counts, but generally no difference was noted among the lung patients and the control group. Thus, alfa 1-antitrypsin was not a factor in the susceptibility of the body to air pollution. Animal experiments were conducted to see the lung system mutation caused by polluted gas acting as a foreign body in a normal lung. Rats were exposed to 500 ppm sulfur dioxide for 1 hr/day for 2 days; 24 hr later, the lung was cut out, minced, and emulsified in a homogenizer. The emulsion was injected into 10 rats; 2 hr later, the blood was taken and plasma was separated. Using the supernatant liquid of the emulsion as an antigen, a blood cell coagulation reaction was tested. The result was negative. The hypothesis that the transformation of the lung caused itself to act as a foreign body was negated.

29596 **APTIC NO. 51403**

Miyamoto, Akimasa

AIR POLLUTION AND RESPIRATORY DISEASES--CLINICAL IMAGES, ESPECIALLY MORBIDITY FACTORS. (3). *(Taiki osen to kokyuki shikkan rinshozo toku ni hasshoinshi ni tsuite). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 11:11, 1973.*

A general clinical picture of the effects of air pollution on the respiratory system, individual factors, allergic factors, respiratory passage susceptibility factors, and low alpha 1-antitrypsin in blood are discussed. Pollutants are extremely complex, but even a single chemical composition could affect morbidity of respiratory passages or lungs. Individual immunity also affects the symptoms. Some animal experiments and a case of a chronic pollutant victim who was exposed to high concentration of chemicals at work will be discussed.

29597 **APTIC NO. 51399**

Nagano, Hitoshi, Yanosuke Sagawa, Hajime Yamabayashi, Tatsuo Satake, Tetsuro Yokoyama, and Toru Takijima

THE STANDARD TECHNIQUE FOR DETECTING THE AIR POLLUTION-CAUSED RESPIRATORY IMPAIRMENT--SPECIAL ANNOUNCEMENT BY THE JAPAN SOCIETY FOR THORACIC DISEASES, SPECIAL COMMITTEE FOR LUNG STUDIES. *(Tokubetsu hatsugen Nihon Kyobu Shikkan Gakkai Haisei-han senmon iinkai, taiki osen ni yoru kokyu shogai o kenshutsu suru tame no sutandato tekuniku). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 11:13, 1973.*

A small special committee was organized for establishing the standard technique for detecting respiratory system damage caused by air pollution. The previous examination methods of pulmonary function were insufficient; various test items including the determination of blood gas must be added. The development of methodology for studies of oxidants is urgently needed. The need for a method of determining the degree of pollution, clarifications of basic and developed symptoms and their relationship, induced symptoms, the sensitivity of the host body, aging and its effect, smoking and its effect, and prediction methods were discussed.

29598 **APTIC NO. 51126**

Nagaoka, Shigeru

CLINICAL STUDIES OF THE EFFECTS OF AIR POLLUTION AND NOISE ON THE HUMAN BODY. *(Taiki osen soon no jintai eikyo ni kansuru rinshoteki kenkyu). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 4:251-255, March 31, 1973.*

The Tokyo Metropolitan Environmental Protection Research Inst. conducted various research projects on various extraordinary environmental factors which affect the human body, and in particular, the effects of air pollution on the respiratory system and the effects of noise on the human auditory sense. Six reports were given by group leaders on: an immunological study of air pollution; the etiology of chronic bronchitis; the effects of air pollution on the upper respiratory duct; the effect of air pollution on children's bronchial asthma; a new biological evaluation method using blood gas analysis; and the effects of white noise on the human hearing.

29599 **APTIC NO. 51581**

Nagaoka, Shigeru

THE EFFECTS OF PHOTOCHEMICAL SMOG ON THE HUMAN BODY. *(Kokagaku sumoggu no jintai ni oyobosu eikyo). Text in Japanese. PPM (Japan), 4(7):57-61, 1973.*

The effects of photochemical smogs known to data include the irritation of the eyes, throat, and the respiratory system, coughs, breathing difficulties, suffocating feelings, lowering of pulmonary oxygen diffusion, exhaustion, and susceptibility to bacteria and virus. Factors known to contribute toward the effect of photochemical smogs, particularly ozone, are: the age, meteorological factors, and physical exercises. With animal experiments, animals with low thyroid functions caused by special feed are known to show less effect of ozone than those with artificially enhanced thyroid functions.

29600 APTIC NO. 51311

Nakamura, Seiichi, Yumiko Nakayama, and Takeo Miura

THE EFFECTS OF AUTOMOBILE EXHAUST GAS ON THE BODY. *(Jidosha haiki gasu no seitai ni taisuru eikyo). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 58-59, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 129.)*

Mice were exposed to 40-60 ppm of carbon monoxide 2 hr daily, for 4 days a week for 9 wk, and the weight and leukocyte fluctuations were examined. Blood samples were taken from the eye socket veins after the exposure, and leukocytes were counted by an automatic blood cell counter. After 9 wk of exposure, radioactive metal particles were injected in the tails of mice, and the blood was sampled to see the speed of elimination of foreign matter. The growth curves of the exposure group and the control group were very close, and there was no difference in the weights of the two groups in 9 wk. The numbers of leukocytes in both groups were 5000-6000/cu mm. When the mice were exposed to exhaust gas, the number decreased to 4000/cu mm, but the discontinuation of exposure on Friday restored the number by Monday. This fluctuation pattern repeated for 9 wk and the degree of leukocyte decrease was always approximately the same. The leukocyte structures of both groups were approximately the same. The liver and the lung of the exposed mice were lighter than those of the control group. The weight of the spleen remained approximately normal. The speed of elimination of foreign matter from the blood for the control group was 0.152, and for the exposed group was 0.135. This proved the lowering of biological defense mechanism.

29601 APTIC NO. 51291

Okutani, Hirotoshi, and Akira Harada

BLOOD COUNT AS AN INDEX FOR LEAD EXPOSURE DAMAGE. *(En bakuro hyoka to shite no ketsueki shisu). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 304-305, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 416.)*

Experiments were done to use the relationship of the lead content in blood and hemoglobin, and of HbB and hematocrit to express logically the effect of a low concentration of lead in the environment. The fluctuations of PbB/Hb and PbB/Ht in the same environment were examined by sex and age. The PbB of women was generally lower than that of men (0.88 of men), and PbB of children was generally higher than adults (1.06 compared to men). Both PbB/Hb and PhB/Ht indexes were slightly higher among female (1.04-1.05 of male), and those of children were clearly higher (1.23-1.26 of male). The correlations between PbB and the two indexes among the workers of a factory showed that from about PbB 60, both indexes had a higher rate of increase. There was a good correlation between the lead concentration in the environment and the indexes. The correlation was higher with the index and the urine lead or the index with the lead in the atmosphere. The PbB/Hb and PbB/Ht were useful in group evaluation in an environment with a low concentration of lead, but they were not necessarily good indicators for individuals.

29602 APTIC NO. 51489

Olson, Dan E., Michael F. Sudlow, Keith Horsfield, and Giles F. Filley

CONVECTIVE PATTERNS OF FLOW DURING INSPIRATION. *Arch. Internal Med., 131(1):51-57, Jan. 1973. 13 refs.*

Studies were carried out in clear, elastic, cast replicas of the normal human airway system (from the mouth to subsegmental bronchi) to determine the fluid dynamic parameters pertinent to aerosol transport and deposition. The geometry of the upper airway system, and flow organizations from mouth to larynx and from larynx to terminal bronchiole are discussed. The velocity organizations (local magnitude and directions), pressures (dynamic and static), and flow instabilities were measured and compared to theoretical predictions. The effect of convective patterns of inspired air on the lungs is considered. (Author abstract modified)

29603 APTIC NO. 51310

Omori, Sayoko, Kazuo Hashimoto, and Takeo Miura

STUDIES ON THE PHYSIOLOGICAL METAL DISTRIBUTION CHANGES IN THE BODY BY A LONG-TERM ADMINISTRATION OF MERCURY AND MANGANESE. *(Hg, Mn choki toyo ni yoru seitai seiri kinzoku bunpu no hendo ni kansuru kenkyu). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 182-183, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 302.)*

Various concentrations of mercury and manganese were administered to guinea pigs and the body hair was sampled from time to time to see the excretion of Hg and Mn. Three Hg groups were given 0.27 mg/kg (group 2), 2.7 mg/kg (group 3), and 27 mg/kg (group 4). The Mn groups were given 0.036 g/kg (group 5), 0.36 g/kg (group 6) and 3.6 g/kg (group 7). These metals in synthetic feed were administered for 6 mo. The animal weights were measured every week, and each time, hair samples were taken. Group 4 showed a clear sign of loss of weight. The Mn groups showed not much difference in weight from the control group. The excretion of Hg began to increase in the fourth week for group 4, and in the 10th week for groups 2 and 3. In the 16th week, group 4 had approximately seven times the amount of Hg excretion it had before the experiment started. The control and Mg groups had no increase of Hg excretion. The amount of Mn excretion for groups 5, 6, and 7 began to increase in the fourth week and steadily increased thereafter. In the 16th week, the amount was approximately 36 times over the amount before the experiment started. The proportion of the excretion of Hg was greater than that of Mn. Other metals such as zinc and chromium were measured in the hair; zinc showed no set pattern of fluctuation. The chromium excretion for all groups was higher before the experiment started, but the type of feed given to guinea pigs before the start of experiment probably caused this phenomenon.

29604 APTIC NO. 51419

Palmes, Edward D.

MEASUREMENT OF PULMONARY AIR SPACES USING AEROSOLS. *Arch. Internal Med., 131(1):76-79, Jan. 1973. 10 refs.*

The purpose of this investigation was to summarize the background, rationale, and present status of work on the use of monodisperse aerosols as tools for estimating the linear dimensions of the lung air spaces. A diagnositic test for pulmonary diseases involving alterations in lung spaces is developed. Procedures were developed in which the subject inhaled a fixed volume of aerosol and held his breath at known lung volumes for a series of times prior to exhalation. With appropriate correcting, the persistance of aerosol could be measured as a function of time of breath holding. The distance that particles must be moved during breath holding by sedimentation or diffusion to reach a wall of the respiratory tract is determined by the size of the air spaces. The time required to reach the wall also depends on this distance. The persistance of aerosols, therefore, provides an index of the size of the air spaces containing aerosol during breath holding.

29605 **APTIC NO. 51145**

Pankow, D. and W. Ponsold

BIOCHEMICAL ASPECTS OF CARBON MONOXIDE INTOXICATION. *(Biochemische Aspekte der Kohlenmonoxid-Intoxikation). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 19(5):321-330, May 1973. 288 refs.*

The influences of carbon monoxide on properties and metabolism of haemoproteides, porphyrines, carbohydrates, amino acids, peptides, albumen, lipids, nuclein substances, acid, base and electrolyte metabolism, and stress are discussed. Of the effects of long-term CO exposure the following are particularly mentioned: increase of hemoglobin and erythrocyte protoporphyrin, serum iron level and serum globulin with simultaneous decrease of serum albumen, concentration changes of trace elements in liver fragments, and decrease of the liver benzopyrene hydroxylase activity. The acute CO intoxication is characterized primarily by a drop of the oxygen pressure in the veins and arteries, a temporary rise of the blood sugar, a drop of the hemoglobin level, increased glycolysis, increase of the glutathione concentration in the blood, and increase of the metabolic azidose.

29606 **APTIC NO. 51211**

Parkinson, David R. and Robert J. Stephens

MORPHOLOGICAL SURFACE CHANGES IN THE TERMINAL BRONCHIOLAR REGION OF NO2-EXPOSED RAT LUNG. *Environ. Res., 6(1):37-51, March 1973. 19 refs.*

The distal airways and neighboring regions of lungs from healthy (control) rats and from rats exposed to 15 plus or minus 2 ppm nitrogen dioxide for 1, 2, and 7 days were dissected and examined with the scanning electron microscope. The three types of bronchiolar epithelial cells were identified on the terminal bronchiolar surface of unexposed animals. Type I, Type II, and alveolar brush cells were identified in the alveolar duct regions. Morphological surface changes involved in the initial response to nitrogen dioxide included loss of cilia and increased uniformity of surface in the terminal bronchiole. Type I cells in the proximal alveolar duct region near the end of the terminal bronchiole were substantially replaced by microvilli-covered cells. Increases in the amount of debris and the number of macrophages were also evident in the response to the gas. Several specimens that had been examined in the scanning electron microscope were subsequently prepared for transmission electron microscopy. (Author abstract)

29607 **APTIC NO. 51142**

Pott, F., A. Brockhaus, and F. Huth

TESTS ON THE PRODUCTION OF TUMORS IN ANIMAL EXPERIMENT WITH POLYCYCLIC AROMATIC HYDROCARBONS. *(Untersuchungen zur Kanzerogenitaet von polyzyklischen aromatischen Kohlenwasserstoffen im Tierexperiment). Text in German. Zentralbl. Bakteriol., Parasitenk. Infektionskr. Hyg. Abt. I:Orig., Reihe B, 157(1):34-43, 1973. 15 refs.*

The difficulties of examining cancer caused by air pollution in animal tests are discussed. An investigation by a subcutaneous test is discussed. Injections of 25-100 micrograms of benzo(a)pyrene in tricaprylin in mice and rats caused a 50% tumor rate. The liquid used for injection of the benzo(a)pyrene played an important role in the tumor rate. Higher doses of tricaprylin with similar doses of benzo(a)pyrene led to a higher tumor rate in mice; tricaprylin without benzo(a)pyrene induced no tumors. The carcinogenic effect of dibenz(a,h)anthracene by a subcutaneous test in mice was as strong as by benzo(a)pyrene. The reaction of the subcutaneous tissue of a mouse to benzo(a)pyrene is more sensitive than that of the rat.

29608 **APTIC NO. 51203**

Prinsloo, H.

EFFECT OF EXPOSURE TO QUARTZ DUST IN VIVO ON PENTOSE CYCLE ACTIVITY IN GUINEA PIG LUNG. *Environ. Res., 6(1):68-76, March 1973. 22 refs.*

Biochemical changes in the Lung resulting from exposure to quartz dust were studied with respect to the effects of dusting on the pentose cycle activity in guinea pig lungs. The activity of glucose-6-phosphate dehydrogenase and 6-phosphogluconate dehydrogenase in the lungs of the exposed group increased progressively to reach 215 and 169%, respectively, of that in the lungs of undusted controls after 219 days. The increase in enzyme activity in the dusted lungs was accompanied by an increase in the proportion of glucose catabolized via the pentose phosphate pathway, which was 50% greater than in normal lungs after 159 days. The increased pentose cycle activity was due to increased phagocytosis evoked by the quartz. The magnitude of the increase coupled with the increase in lung weight was sufficient to cause a 10-20% Increase in pentose cycle activity in the whole animal. (Author abstract modified)

29609 **APTIC NO. 51304**

Reid, Watson D., Kenneth F. Ilett, Jane M. Glick, and Gopal Krishna

METABOLISM AND BINDING OF AROMATIC HYDROCARBONS IN THE LUNG. RELATIONSHIP TO EXPERIMENTAL BRONCHIOLAR NECROSIS. *Am. Rev. Respirat. Disease, 107(4):539-551, March 1973. 31 refs.*

Experimental bronchiolar necrosis was elicited in mice and rats by intraperitoneal doses of bromobenzene or other aromatic hydrocarbons, and the metabolism and binding of the hydrocarbon in the lung were studied. The lesion was associated with the binding of a bromobenzene metabolite to bronchiolar epithelial cells. Pulmonary microsomal enzymes converted bromobenzene to a metabolite that became bound to microsomal proteins in vitro. (Author summary modified)

29610 **APTIC NO. 51161**

Reinke, R. E. and C. F. Reinhardt

FIRES, TOXICITY, AND PLASTICS. *Mod. Plastics, 50(2):94-95, 97-98, Feb. 1973. 21 refs.*

The only uniform features in the toxicology of burning plastics are those of the toxicology of fire: heat, by destruction of tissue (direct burns) or thermal shock; carbon monoxide; oxygen deficiency; other combustion gases including carbon dioxide, nitrogen compounds, halides, phosgene, and sulfur compounds; and smoke. The hazard from combustion or thermal decomposition of a polymer should be determined from biological data obtained by combustion of the polymer and should be compared under equivalent conditions with that of wood or other appropriate materials. Experimental animal data on the comparative toxicity of burning plastics and other materials are summarized. Also included are comparative data on hydrogen cyanide measured in the pyrolysis products of various materials, including polyurethane foam, and on the amounts of combustion products generated by burning building materials.

29611 **APTIC NO. 51707**

Saidel, G. M., T. C. Militano, and E. H. Chester

A THEORETICAL BASIS FOR ASSESSING PULMONARY MEMBRANE TRANSPORT. CONTINUOUS CO MONITORING DURING A SINGLE-BREATH MANEUVER. *Bull. Physio-Pathol. Respir. (Nancy), 9(2):481-496, March/April 1973. 13 refs.*

Abnormal gas transport through the airways and alveoli was distinguished from abnormal transport across the pulmonary membrane by comparison of experimental data to model situations with a five-compartment, series-parallel model of airway and alveolar regions. The model, which can simulate gas transport in normal and in chronically obstructed lungs, was used to compare steady-state and single-breath transport experiments with carbon monoxide as the test gas. Based on the model simulations, a new method of analysis of the single-breath test was suggested that can yield a pulmonary membrane transport parameter. For each subject, the value of the pulmonary membrane parameter was invariant over a wide range of breathing patterns. This invariance was a major advantage over diffusing capacities obtained by standard techniques. Simulations predicted the method is applicable to normal and abnormal lungs. (Author abstract)

29612 **APTIC NO. 51337**

Saito, Kazuo and Hidematsu Takakuwa

STUDIES ON THE TOXICITY OF GASOLINE, NO. 3: GASOLINES CONTAINING ORGANIC SOLVENTS. *(Gasorin no dokusei ni kansuru kenkyu, daisanpo, yuki yozai konnyu gasorin ni tsuite). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 376-377, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 506.)*

The toxicity of leaded white gasoline with organic solvent was studied by electroencephalograms and mortality of rats. Leaded white gasoline (LG) had tetraethyl lead in the amount of 16.5 mg/kg, and the leaded white gasoline with solvent (LBTX) had benzene 5%, toluene 10%, xylene 15%, and tetraethyl lead 11.6 mg/kg. Electroencephalograms were taken before the injection, and every day up to the fifth day after the injection and then seventh and tenth day. The basic waves, instant index, and 10-second cumulative index for each belt were examined. The LG group showed inactivity and sluggish movement from the first to fourth day after the injection; walking started on the fifth day, and agitation, hypertension, and fear appeared on the sixth day reaching the peak on the eighth day. The LBTX group showed the similar sluggishness up to the fourth day. From the fifth day, walking started, but no agitation appeared and the actions were relatively slow. The non-leaded white gas group and LG group had almost no mortality. The LBTX group had a 40% mortality on the first day, 68% on the second day. A regular gasoline sold at a gasoline stand created 60% mortality on the fourth day, and the survival rate on the sixth day and after was 25%. High octane gas showed similar acute poisoning symptoms as the LBTX group and the survival rate after the third day was 20%. The electroencephalogram results are presented in graphs.

29613 **APTIC NO. 51268**

Sakurai, Haruhiko and Jun Kagawa

PROBLEMS IN THE CONCENTRATION ADJUSTMENT OF URINE SPOT SAMPLINGS. *(Nyo supotto sanpuru ni okeru nodo hosei no mondai). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 186- 187, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 304.)*

In urinalysis, the most important factor in accurate measurement of the environmental pollutant is the effects of concentration or dilution of urine samples. Urine samples of a number of students were taken to see the effects of concentration, dilution, and the relationship between normal amount of urine and creatinine excretion. Creatinine is one of few materials which is free of the influence of urine amount. For other materials (pollutants), the relationship between the urine amount and the total pollutant in urine, urine protein, urine lead, and urea, is stable if the amount of urine is normal and set; but the relationship is distrubed when urine is diluted by the intake of much water. The concentration adjustment of spot sampling must be given by using a material which is normally present in urine which has the same urine-excretion curve as the pollutant to be measured. At the present level of information, an adjustment using the specific weight of urine is much more dependable than using creatinine.

29614 **APTIC NO. 51406**

Seto, Katsuo, Masazumi Kawakami, Kido Sugita, Masao Shishido, Mizuoko Yamaji, and Tsuneyuki Tsuda

INFLUENCE OF INHALATION OF OZONE AND NITROGEN DIOXIDE ON THE FORMATION OF PHOSPHOLIPIDS ON THE LUNG. *(Hai no rin shishitsu no seisei ni taisuru ozon oyobi nisanka chisso kyunyu no eikyo). Text in Japanese. Igaku to Seibutsugaku, 86(5):317-320, May 10, 1973. 8 refs.*

The effects of ozone ana nitrogen dioxide inhalation of the formation of phospholipids were examined on lung slices of rabbits exposed to O3 and NO2. The amount of 14C of 14C-1-acetic acid taken into various phospholipids elements were observed. Roehm and Hadley method of O3 and NO2 exposure was used, and the Chida and Adams method was used for the measurement of 14C in phospholipids. The amount taken in was greatest into lectithin (LC), next into sphingomyelin (SP), and the amount taken into phosphatidyl inositol (PI) plus phosphatidyl serine (PS) and phosphatidyl pthanolamine (PE) was relatively low. The result generally agreed with the experiments of Chida and Adams and with the lung slices of sheep. There were some fluctuations caused by different inhalation conditions, but generally, the amount of 14C taken into SP, LC, PI plus PS, and PE were considerably reduced by the exposure of animals to 0.5 ppm and 1.0 ppm of ozone for 1-2 weeks. The exposure to 5 ppm of NO2 for 2 weeks and 10 ppm of NO2 for 1-2 weeks reduced the amount of 14C intake into LC remarkably.

29615 **APTIC NO. 51208**

Shimizu, Takaharu, Yasushi Ishibashi, and Misae Takagi

A STUDY ON HAY FEVER OF THE FLEABANE POLLEN. *(Shokagata kikuka kafunsho -- harujion kafunshorei). Text in Japanese. Jibi to Rinsho (Clin. Otolaryngol.), 19(2):132-136, 1973. 27 refs*

The relationship between hay fever symptoms and the distribution of Fleabane pollen was studied. A case of hay fever was reported, characterized by nasal attacks and eye itching. Based on skin and ophthalmic tests, the cause was traced to Fleabane pollen.

29616 **APTIC NO. 51241**

Speizer, Frank E. and Benjamin G. Ferris, Jr.

EXPOSURE TO AUTOMOBILE EXHAUST. I. PREVALENCE OF RESPIRATORY SYMPTOMS AND DISEASE. *Arch. Environ. Health, 26(6):313-318, June 1973. 18 refs.*

The prevalence of chronic, nonspecific respiratory disease was assessed using a modified version of the Medical Research Council s respiratory disease questionnaire in a population of 268 policemen exposed to a spectrum of levels of automobile exhaust as traffic officers, patrol car officers, and indoor clerical officers. There were 99 men(36.9%)who fulfilled the usual criteria used with the questionnaire for the diagnosis of disease. Data are presented to show that the men represent comparable groups and that smoking, and to a lesser extent traffic exposure, are associated factors in the development of disease. A summary of the environmental data is presented to indicate the kinds of exposure these men experience. Annual medical assessment and seasonal environmental assessments are planned to permit prospective evaluation of the effects of chronic exposure to automobile exhaust. (Author abstract)

29617 **APTIC NO. 51242**

Speizer, Frank E. and Benjamin G. Ferris, Jr.

EXPOSURE TO AUTOMOBILE EXHAUST. II. PULMONARY FUNCTION MEASUREMENTS. Arch. Environ. Health, 26(6):319-324, June 1973. 8 refs.

Pulmonary function tests were performed on 267 policemen with defined exposure to automobile exhaust as part of their initial assessment in a prospective study of health effects of exposure to automobile exhaust. Differences in exposure were monitored with both historical data on exposure in traffic and measures of hair lead concentrations. In spite of differences in apparent exposure, no differences in any of the pulmonary function test findings could be identified after standardizing for age, height, and cigarette smoking habits. Flow-volume measurements appeared to be more sensitive to levels of cigarette smoking tham measurements of forced expiratory volume in one second. This prospective investigation is designed to follow changes in pulmonary function over several years, using each man as his own control and repeatedly assessing actual street level exposure to automobile exhaust. (Author abstract)

29618 **APTIC NO. 51591**

Spomer, L. Arthur

FLUORESCENT PARTICLE ATMOSPHERIC TRACER: TOXICITY HAZARD. *Atmos. Environ., 7(3):353-355, March 1973. 19 refs.*

The toxicity hazard of a fluorescent particle atmospheric tracer commonly used in atmospheric diffusion and air pollution studies is reviewed. The tracer is a finely powdered mixture of zinc sulfide and cadmium sulfide. Cadmium and cadmium compounds are highly toxic with symptoms of varying degrees depending on kind and degree of exposure. Acute Cd poisoning can result in pulmonary edema, pneumonitis, alveolar cellular proliferation and metaplasia, arterial thrombi, renal necrosis, and death. Immediate symptoms of Cd inhalation include throat dryness, irritation, cough, chest pain, chills, weakness, headache, nausea, vomiting, and diarrhea. Even brief exposure to high concentrations may result in pulmonary edema and death. Long term effects include emphysema, anemia, hypertension, bone lesions, and death. The common use of the fluorescent tracer, therefore, does present a potential health hazard.

29619 **APTIC NO. 51528**

Stuart, Bruce O.

DEPOSITION OF INHALED AEROSOLS. *Arch. Internal Med., 131(1):60-73, Jan. 1973. 109 refs.*

Experimental studies of theoretical models describing the deposition of aerosols in the respiratory tract as a function of particle size and respiration patterns are reviewed. Descriptions of the anatomical structure of the respiratory tract, air flows, and the physical behavior of airborne particles are given. These illustrate the basis of the various models of inhaled particle deposition. Particle density, shape, hygroscopicity, and pathology influence particle deposition. The particle size distribution and deposition site of the inhaled aerosol influence the resultant biological response. (Author abstract)

29620 **APTIC NO. 51270**

Stupfel, Maurice, Monique Magnier, Francoise Romary, Marie-Helene Tran, and Jean-Paul Moutet

LIFELONG EXPOSURE OF SPF RATS TO AUTOMOTIVE EXHAUST GAS. *Arch. Environ. Health, 26(5):264-269, May 1973. 18 refs.*

Pathogen-free Sprague-Dawley rats (SPF) were exposed to automotive exhaust gas from 2.5 mo to 2 yr for 6 hr/day, 5 days each week. The exhaust gas contained 50 ppm of carbon monoxide and two different concentrations of nitrogen oxides (0.2 and 23.0 ppm), carbon dioxide (0.65% and 0.370%), and aldehydes (0.1 and 2.0 ppm). Only the dilution with the highest content of nitrogen oxides produced biological effects: decrease in body weight, diminution of the sound avoiding reflexes, and an increase in the number of spontaneous tumors. This dilution did not influence the heart rate, ventricular complex (QRS) II electrocardiographic deflection, the survival of the rats, or the renal and aortic lesions resulting from aging processes. The emphysematous process was accelerated. (Author abstract)

29621 **APTIC NO. 51125**

Suzuki, Takeo

AUTOMOTIVE EMISSION GASES AND VARIOUS PROBLEMS OF PUBLIC HEALTH. *(Jidosha haishutsu gasu no koshu eiseigakuteki shomondai). Text in Japanese. Nippon Kikai Gakkai-shi (Journal of the Japanese Society of Mechanical Engineers) (Tokyo), 76(653):106-113, May 1973. 6 refs.*

The known effects of various elements in automobile emission gases on the human body are reviewed. The elements examined are: carbon monoxide, nitrogen oxides, aromatic hydrocarbons, suspended particulates (lead, polynuclear hydrocarbons, and others), and photochemical pollutants. The known elements for photochemical smogs are ozone, peroxyacetyl nitrate (PAN), nitrogen dioxide, aldehydes, and acrolein. Eye irritation and breathing difficulty can be caused in photochemical oxidants as low as 0.15 ppm. The human threshold for detection of ozone is 0.02 ppm for 5 min, but the body can be acclimated rapidly. Lung functions are affected by 0.6 ppm ozone, and the gas dispersion capacity of alveoli and the ventilation capacity are reduced. Resistance to the air in the respiratory passage occurs by 1 ppm ozone after 1 hr, and pathological transformations occur in the upper respiratory ducts. However, these effects largely depend on individual susceptibility. The chronical effects of various pollutants must be watched on chronic bronchitis, bronchiole, emphysema, lung fibrosis, and bronchial asthma. Ozone quickens the deterioration of the lung system. Ozone also enhances the ssusceptibility of trachea to bacteria and virus.

29622 **APTIC NO. 51714**

Szczeklik, Andrezej, Karmena Stanakowska, and Irena Frydecka

CARDIOPULMONARY FUNCTION IN ALPHA-1-ANTITRYPSIN HETEROZYGOTES EXPOSED TO SEVERE AIR POLLUTION. *Am. Rev. Respirat. Disease, 107(2):289-291, Feb. 1973. 9 refs.*

Eleven heterozygotes with alpha-1-antitrypsin deficiency were compared with 11 subjects with normal concentrations of serum alpha-1-antitrypsin. Both groups were studied before and after a 7-year exposure to dust at work. Electrocardiographic changes suggestive of right ventricular abnormalities and decreased vital lung capacity occurred more frequently in the heterozygotes with alpha-1-antitrypsin deficiency. The results suggest that determination of the serum trypsin inhibitory capacity might be of prophylactic value in industrial medicine. Persons with intermediate levels of serum trypsin inhibitory capacity should not work in a highly polluted atmosphere. (Author summary modified)

29623 **APTIC NO. 51382**

Takagi, Sadataka

ON BAD ODORS. *(Akushu ni tsuite). Text in Japanese. Kankyo Kenkyu (Environ. Studies), no. 3:104-112, May 1973.*

Characteristics of the olfactory sense, human sensitivity to smells, the quality of an odor and its relative concentration, human adaptability to odors, individual differences, the fluctuation of odor thresholds by physical condition, weather, smoking, olfactory apparatus, and the effect of odors on the human body are discussed. The effects of the body include on the respiratory system, circulatory system, digestive system, reproductive system, skin, eyes, psychology, and the brain waves. A bad odor stops the inhalation function involuntarily. When a rabbit is subjected to an odor, the breathing is gradually quickened, and as the concentration is increased, the breathing slows down; the breathing stops temporarily when the concentration is greatly increased. But the breathing is resumed due to the increase of carbon dioxide in blood. Inhalation then is shallow and quick, and as the animal is acclimated to the smell, the breathing returns to normal. Respiratory damages do not occur from odors, unless the pollutant with the odor invades the respiratory passages or the lungs. Good smell prompts deep breathing and has a calming and pleasing effect or nerves. This is caused by the lowering of blood pressure and the releasing of tension.

29624 **APTIC NO. 51129**

Takayama, Otohiko

THE EFFECTS OF AIR POLLUTION ON THE UPPER RESPIRATORY DUCT (REPORT NO. 3). *(Taiki osen no jokido ni oyobosu eikyo ni tsuite). Text in Japanese. Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 4:252-253, March 31, 1973.*

A model experiment confirmed that the air collides in the epiglottis and epiglottic vallecula when the air passes through the upper respiratory tract. A pathological analysis was given to the larynx and trachea of autopsied silicosis patient, and the history of the contacts of the larynx and trachea with dusts and silica dusts were studied. It was conjectured that dusts or silica dusts invaded the respiratory tract, affecting trachea rather than larynx, especially the bifurcation point of the trachea. This was confirmed by animal experiments. The effect of rinsing pharynx was explained using an image amplifier, and the movement of the rinsing water was studied by a movie film. Out of the 20 cases studied, 10 of them had had tonsilectomy. In nine out of 10 normal cases the rinsing water stayed in the oral cavity, but in all 10 tonsilectomy cases, part of the rinsing water reached the lower pharynx and moved in the area. Rinsing of the mouth in a normal healthy person cleansed the oral cavity but did not reach the lower pharynx area.

29625 **APTIC NO. 51353**

Tomenius, Lennart

A METHOD FOR DETERMINING THE RETENTION OF INHALED PARTICLES IN A BRONCHUS. *Environ. Physiol. Biochem., 3(1):1-12, 1973. 7 refs.*

A quantitative method to determine the retention of inhaled particles in a bronchus in experimental animals was developed. The method is based on free dissection of bronchial sections from formaldehyde-exposed and dried lungs. The regional retention is estimated as the particle content after free dissection compared to the particle content in the whole lung. The method was tested on the lungs of rabbits exposed to 7-micron particles. The regional deposition was on the average 1% in the main bronchus with prolonging from the right lower lobe.

29626 **APTIC NO. 51417**

Uchiyama, Teruo

BIOCHEMICAL STUDIES. *(Seikagaku men kara no kosatsu) Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan J. Thoracic Dis.), vol. 11:12-13, 1973.*

The effects of ozone inhalation on lung function were studied by examination of lipid metabolism. Ozone is believed to damage the surfactant of the upper lungs and the lipid (especially phospholipid) on the membrane of alveoli epithelium. Peroxidation of lipid causes damage to the lung function and the activity of enzymes, eventually causing emphysema. Rabbits and rats were exposed to 5-10 ppm of ozone for 1-4 hr, and the lung system and the surfactant fat were extracted by the Folch method. Lipid was analyzed by thin layer and gas chromatography. The continuation of O_3 inhalation caused the death due to emphysema. Chromatography indicated a decrease in lecithin and the inhibition of C-palmitin absorption by phospholipid. The amounts of peroxide lipid before and after the inhalation of O_3 were measured by TBA. The TBA increased with time, and the increase was particularly clear in the triglycelide area. This was conjectured to be related to the amount of nonsaturate fatty acid. A decrease in the activity of Na-K, ATPase was recognized. Peroxidation of lung lipid layer can be controlled by vitamins E and B lactic acid ester.

29627 **APTIC NO. 51367**

Uezuka, Masuo

CHRONIC RHINITIS AND LARYNGITIS PRESUMABLY CAUSED BY AIR POLLUTION. *(Kuki osen ni yoru to omowareru mansei bi-kotoen). Text in Japanese. Jibi Inkoka Tenbo (Oto-Rhino-Laryngol.), 16(1):43, 1973. 1 ref.*

Whether chronic rhinitis and laryngitis are caused by air pollution is difficult to determine clinically. Examinations were given to 10 chronic rhinitis and laryngitis patients with rubber balloons. Each patient was given a balloon to see how many exhalations were required to blow up a balloon to a certain size. The tests were given at a polluted working area and in a clean air environment. Six patients reported a clear and significant difference by the environment, whereby less exhalation was required in a clean air environment than a polluted environment. For patients in urban environments, nebulizer treatments are strongly recommended. The nebulizer solution consists of 50,000 units of colistin, 0.5 ml of dectane, and 1-2 ml of cepharanthine. This nebulizer has a definite clearing effect on the respiratory passage.

29628 **APTIC NO. 51148**

Vassallo, Charles L., Bill M. Domm, Robert H. Poe, Michael L. Duncombe, and J. Bernard L. Gee

NO_2 GAS AND NO_2-EFFECTS ON ALVEOLAR MACROPHAGE PHAGOCYTOSIS AND METABOLISM. *Arch. Environ. Health, 26(5):270-274, May 1973. 23 refs.*

The in vitro effects of nitrogen dioxide gas and nitrite ion on the rates of entry and killing of the bacteria Staphylococcus epidermidis and Pseudomonas aeruginosa were measured in rabbit alveolar macrophages (AM) adherent to a glass surface. The metabolism of AM was studied in shaking cell suspensions with heat-killed epidermidis as test particles. Both NO_2 and nitrite ion (10 to 15 millimols) diminished bacterial entry and intracellular killing and increased (14)CO_2 production from (14)C-1-glucose, (14)C-6-glucose, and (14)C-1-pyruvate. In view of the potential role of hydrogen peroxide as an intracellular bactericidal agent, the effects of nitrogen dioxide and nitrite ion in catalase-dependent hydrogen peroxide metabolism were studied. Both nitrogen dioxide and nitrite radical reacted with catalase: H_2O_2 compound 1, as judged by diminution of formate oxidation and the sensitivity of AM catalase to aminotriazole inhibition. (Author abstract modified)

29629 **APTIC NO. 51673**

Wakayama, Yasuji

SUDDEN DEATH BY SO-CALLED DEATH AIR. *(Iwayuru shi no kuki ni yoru kyushi ni tsuite). Text in Japanese. Nichidai Igaku Zasshi (Nippon Univ. Med. J.), 32(1):15-23, 1973. 9 refs.*

Deaths by so-called death air were statistically studied in the Tokyo area, and experiments with rabbits were conducted. The main causes of deaths were: inhalation of large dosage of carbon dioxide in a manhole or in other circumstances; suffocation in large, unused ice boxes; inhalation of oxygenless air; and inhalation of methane or propane gas. In most cases anoxia and asphyxiation were the causes of deaths. Rabbits were enclosed in an air tight box, and a blood gas analysis was given for pH, POx, H and PCO_2. The amount of oxygen in the chamber was measured by a gas detector, and the temperature and humidity were measured by the Ace Hygro-meter. Children killed in ice boxes have aphyxiation cyanosis, strong death hypostasis, intestinal congestion, dark red blood, brain swelling, and internal bleeding. Experiments with an air-tight chamber showed acidosis with pH 7.0 and a prolonged asphyxiation. Experiments with CO2 resulted in a rapid death caused by anoxia with a strong acidosis with pH 6.8. When the normal amount of oxygen in the air (21%) is reduced to 13%, rabbits survive only for 2.5 hr with 9.5% oxygen, they live for 1.5 hr; and in less than 6% oxygen, they die immediately. Blood pH at that point is less than 7.0, POx less than 15 mmHg, and PCO2 is not much higher. When rabbits are exposed to methane or propane gas, and if the amount of oxygen is maintained at 21%, they do not die, and there is no change in the body fluid content. This proves that the deaths caused by methane or propane gas are actually caused by lack of oxygen. The experiments revealed that in oxygenless air, the changes come to PCO2 and PO2 early and to pH much later.

29630 **APTIC NO. 51428**

Wilson, Archie F., Harold S. Novey, Raymond A. Berke, and Edgar L. Surprenant

DEPOSITION OF INHALED POLLEN AND POLLEN EXTRACT IN HUMAN AIRWAYS. *New England J. Med., 288(20):1056-1058, May 17, 1973. 9 refs.*

Effects of the deposition of inhaled pollen and pollen extract in human airways were investigated. The distribution of inhaled pollen extract was studied. Six males and three females were used in this experiment. Pollen grains were inhaled through the mouth with the nose blocked. Airflow rates were measured during pollen inhalation by attaching a pneumotachograph to the proximal end of the Spinhaler. Of the six subjects who inhaled whole pollen, three had peak airflow rates of 0.4 to 0.5 l/sec with inspired volumes of 1.0 to 1.32 l and the other three had peak airflow rates from 1.6 to 2.1 l/sec with inspired volumes of 1.7 to 2.2 l. Individual subjects inhaled from 17 to 79 micrograms of pollen. In the case of pollen extract, oropharyngeal deposition was quite pronounced. About 10% of inhaled extract reached the lungs. It appeared that deep breathing was associated with slightly more lung deposition. Particles of the size and shape of P. pratensis with average diameter of 25 micron are effectively excluded from inhalation into any portion of the lower respiratory tract. Pollen extract deposits in lungs to a moderate extent.

29631 **APTIC NO. 51165**

Yamaguchi, Masayoshi, Yasunobu Suketa, and Takeo Yamamoto

STUDY ON THE DEPOSITION OF CALCIUM IN THE LIVERS OF RATS INTOXICATED WITH LEAD. *(Enchudoku ratto kan ni okeru karushiumu no chinchaku ni tsuite). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 19(2):53-57, 1973. 15 refs.*

The movement of trace metals in the liver of rats intoxicated with lead acetate was examined to determine the mechanism of indirect action of lead on the body. The concentrations of copper zinc, magnesium, and manganese in the liver did not differ for the lead-poisoned and control groups. The concentration of calcium in the treated rats, however, increased 25.77 times and the contents of iron decreased about 1/3 when compared with the control rats. Stannous acetate, zinc acetate, manganese acetate, and calcium acetate administration had an equal effect on the amount of calcium in the livers of both groups. The concentration of calcium in the kidneys of the rats treated with stannous acetate, however, increased 6.19 times. After a single interperitoneal administration of lead acetate, the amount of calcium in the liver reached a maximum after 72 hr; the deposition of calcium increased rapidly in linear proportion to the amount of lead administered.

29632 **APTIC NO. 51225**

Yokoyama, Eiji

THE EFFECTS OF LOW-CONCENTRATIONS OF OZONE ON THE LUNG PRESSURE OF RABBITS AND RATS. *(Teinodo ozon no ieusagi oyobi ratto haiatsuryo kankei ni oyobosu eikyo). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 134-135, 1973. (Presented at the Japan Society of Industrial Hygiene Annual Meeting, 46th, April 1973, Paper 223.)*

Experiments were conducted to see the effects of low concentrations of ozone on the lung pressure stability and its relationship with the quantity of air. Approximately 50 cc of air was injected into the left pleural cavity of rabbits to create apneumatosis. Under this condition, only the right lung was exposed to 1 ppm ozone for 3 hr, and the left lung was used as a control sample. After the exposure, the air in the left pleural cavity was gradually eliminated, and 30 cm water pressure was given through a mask. One, three, seven, and 14 days later, the rabbits were killed and the lungs were taken out. The fluctuation of the lung air quantity and the transpulmonary pressure were examined. For examination of resistance of the lungs to ozone, rats were exposed to 1 ppm ozone for 3 hr, 0.5 ppm for 6 hr, 0.5 ppm for 3 hr (twice), and killed 1 wk later. The right lungs of the rabbits killed 1 day and 3 days after the exposure had significantly reduced their capacity. Those killed 7 days later had reduced somewhat, but the difference was not significant. The air quantity in the right lung under the pressure of 30 cm water showed a significant difference from the left lung, and the stability was poor. The examinations using biological saline water showed no difference between the right and left lungs and proved that there was no histological resiliency damage in the ozone exposed lung.

29633 **APTIC NO. 51131**

Yokoyama, Tetsuro

THE EFFECTS OF AIR POLLUTION ON RESPIRATORY FUNCTIONS: A NEW BIOLOGICAL EVALUATION METHOD. (REPORT NO. 5). *Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 4:254-255, March 31, 1973.*

Various lung function tests were given to hospitalized patients, day patients, and residents of a district in Tokyo. Some of the findings were as follows: spirometry is unsuitable as the central method for screening of patients; blood gas examinations are more important; the alveolar air and the artery blood gas partial pressure difference can be used effectively for the evaluation of blood gas; however, some simplified method must be developed for field tests; and 3 Hz respiration impedance can be used effectively. The measurement of alveolar air and the artery blood gas partial pressure difference indicate clearly the gas exchange impairment at the alveolar level. The calculation of artery blood oxygen partial pressure (Pao2) was extremely close to the measurement of the oxygen partial pressure of alveolar air (Pao2).

29634 **APTIC NO. 51418**

Yokoyama, Tetsuro

EXAMINATION OF RESPIRATORY FUNCTION DISORDER CAUSED BY AIR POLLUTION. *(Taiki osen ni yoru kokyukino shogai no kensaku). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 11:12, 1973.*

After many years of evaluation of the formerly used spirometer, a new respiratory function screening device was designed and a data handling system was developed. The new spirometer has many improvements over the previous type and simplified the procedure. It is imperative to establish standards for normal healthy persons as quickly as possible using this device. The examination of ventilation function damages by a combination of spirometry and inhalation resistance is vastly unsatisfactory. For accurate evaluation of respiratory function damages (especially those caused by photochemical oxidants), artery blood gas measurement is essential.

29635 **APTIC NO. 51238**

Yoshikawa, Hiroshi and Katsunori Honma

THE TOXICITY OF INHALED CADMIUM FUMES. *(Kadomiumu hyumu no kyunyu dokusei). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 276-277, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 402.)*

The acute toxicity of cadmium was studied by exposing rats to various concentrations of 0.2 micron cadmium fumes for 30 min. The mortality and concentration were as follows: 100% mortality in 30 mg/cu m of cadmium; 80% in 27 mg/cu m; 20% in 23.4 mg and 19 mg/cu m; and zero in 12 mg/cu m. All deaths occurred within 72 hr after the exposures, but mainly between 24-48 hr. The LD50 of rats in 30 min was approximately 25 mg/cu m. Inhalation of 12 mg/cu m of Cd had no effect on the weight of the rats, but the weight of rats who inhaled approximately 30 mg was greatly reduced. The surviving rats regained the weight 3-5 days after the experiment. The Cd deposit in the lung was approximately 30%. Breathing difficulty occurred several hours after the inhalation, and an autopsy 24 hr later showed great swelling and hemorrhages of the lungs and a large amount of air bubbles in the bronchi. Seven days after the inhalation, the swelling and the brownish spots on the lungs remained; the lung weight ratio was still going up, but the lung water quantity had returned to normal. The Cd deposit in the lungs was removed relatively quickly and easily; but the deposit in the kidneys increased in 7 days.

29636 **APTIC NO. 51393**

Yoshimoto, Toshifumi

A SURVEY OF AIR POLLUTION HEALTH EFFECT, RESPIRATORY SYMPTOMS ON COUGH AND PHLEGM. *(Taiki osen ni yoru kokyuki shojo, toku ni seki, tan ni oyobosu eikyo). Text in Japanese. Teishin Igaku (Med. J. Communication), 25(5), 1973.*

Epidemiological studies of postal workers were carried out in 1964 in the most polluted district and less polluted districts of Osaka. Similar studies were made in 1972 by questionnaire and compared. The ratio of those with cough and sputum symptoms were 26.9% in 1964 in the polluted area and 45.4% in 1972. In other three control areas, morbidities were 28.4%, 26.1%, and 12.0%, respectively, in 1964, and 34.0, 32.2, and 33.0% in 1972. Since 1970, in areas most rapidly developing pollution, postal workers were given questionnaires based on the British Medical Research Council s example. The morbidity for cough and sputum in 1972 ranged between 3.7% (control area) and 19.9% (polluted area). for mail carriers. Indoor worker morbidity was 4.7% in the polluted area and 3.9% in the controlled area. The average amount of settling particles (nonsolubles only) for 1970 was 16.42 tons/mo/sq km and 10.41 tons in 1971. In the control area, the averages were 7.15 and 5.95 tons respectively.

29637 **APTIC NO. 51589**

Zapletal, A., J. Jech, T. Paul, and M. Samanek

PULMONARY FUNCTION STUDIES IN CHILDREN LIVING IN AN AIR-POLLUTED AREA. *Am. Rev. Respirat. Disease, 107(3):400-409, March 1973. 16 refs.*

The effects of air pollution on pulmonary function were studied in 111 children, 10-11 years old, who lived for more than 5 years in an area with increasing concentrations of sulfur dioxide and dust particulates. All results of a field screening spirometry including forced vital capacity and forced expiratory volume in 0.5, 0.75, and 1.0 sec did not exceed the 95% confidence limits for healthy children. The children with the lowest values of FEV were subjected to a complete lung function study. In six of the 19 children, a significant reduction of maximal expiratory flow was determined, indicating airway obstruction. (Author summary modified)

1972

29638 **APTIC NO. 51059**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Dept.

MATERIALS FOR COUNTERMEASURES CONCERNING ENVIRONMENTAL POLLUTION BY CADMIUM. *(Kadomyumu kankyo osen taisaku shiryo). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 385-393, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service Fujisawa, 16p.*

Outlines are presented for future measures and studies to be done on Itai-itai disease and cadmium contamination of the environment. The nature and genetic cause of Itai-itai disease is reviewed, as well as the present state of detection methods. The Itai-itai disease (chronic cadmium poisoning) was induced in women at or past menopause who lived in a particular area (Jinzu River Basin) for over 30 years and have ingested cadmium through foodstuffs and drinking water. Future efforts will be focused on scientific and technical investigations and research for the prevention and therapy of this disease. The basic policy of the essentials of tentative countermeasures is to provide pollution control methods for cadmium. The outline deals with: selection of subject areas for investigation; research methods; health preservation measures including investigations of Cd intake and inhabitants health; establishment of a health preservation system; measures to minimize Cd intake; and countermeasures toward cadmium refinery, mining, and smelting plant sources.

29639 **APTIC NO. 51062**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Dept.

ENVIRONMENTAL POLLUTION BY CADMIUM IN ANNAKA AND COUNTERMEASURES BY THE WELFARE MINISTRY. *(Annaka no kadomyumu kankyu osen to koseisho no taisaku ni tsuite). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 321-328, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 13p.*

Investigations were carried out in areas with mines and smelting works producing cadmium. Health checks were conducted in the Annaka district of Japan to determine cadmium concentrations in the inhabitants and detect Itai-itai disease. Air quality measurements were made on two occasions to determine the amounts of cadmium and lead in the air. Analysis of cadmium concentrations in rice held as stock is being undertaken. In addition a case history is presented of a male who died of cadmium poisoning.

29640 **APTIC NO. 51063**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Dept.

ESSENTIALS OF THE INVESTIGATION IN 1969 RELATING TO REGIONS WHERE OBSERVATION IS REQUIRED REGARDING ENVIRONMENTAL POLLUTION BY CADMIUM, OPINION OF THE WELFARE MINISTRY REGARDING THIS AND COUNTERMEASURES TO BE TAKEN. *(Kadomyumu kankyo osen yokansatsu chiiki ni kansuru 44 nedo kankyu chosa no yoyaku oyobi koseisho no kenkai to kongo no taisaku). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 233-262, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 53p.*

Results of investigations of the differential diagnosis of Itai-itai disease and cadmium toxicosis, and of the cadmium intake and accumulation in the observed districts are reported. Specific outlines of the investigations and surveys are given. The first investigation was carried out to establish the method for differential diagnosis; in it inhabitants were examined for chronic cadmium poisoning. To diagnose chronic cadmium poisoning, the urine concentration of cadmium and a renal biopsy were considered, and the properties of albuminuria studied. The second investigation was carried out to clarify the cadmium intake from foods and to obtain data useful in estimating cadmium accumulation in the inhabitants of the study areas. A survey was also done of atmospheric diffusion in an area with smelting works to measure sulfur oxides and cadmium in suspended particulates. Data for all studies are presented in tables. Such investigations should be continued in the future, and emission standards should be set for industrial sources of pollutants.

29641 **APTIC NO. 51064**

Ministry of Health and Welfare (Japan), Bureau of Environmental Sanitation

OPINION OF THE WELFARE MINISTRY WITH REGARD TO ENVIRONMENTAL POLLUTION BY CADMIUM IN THE BASIN OF THE OKUDAKE RIVER IN OITA PREFECTURE AND COUNTERMEASURES TO BE TAKEN. *(Oita-ken Okudake-gawa ryuiki ni okeru kadokyumu kankyo osen ni kansuru koseisho no kenkai to kongo no taisaku). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 175-194, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 35p.*

Environmental pollution by cadmium was investigated in the basin of the Okudake River in Oita Prefecture of Japan. Studies were done of food, (rice), drinking water, discharge water, and river water contamination by cadmium. Health examinations of the inhabitants were undertaken to determine the amount of cadmium in urine and to detect the presence of Itai-itai disease. Trace analysis of cadmium in air was also done. All investigations are described and resultant data evaluated. On the basis of reviewed data, the Ministry decided that periodical analytical investigations should be continued in the area, research and epidemiological studies prolonged, and temporary emission control standards set for the areas mining and smelting operations.

29642 **APTIC NO. 51066**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Dept.

OPINION OF THE WELFARE MINISTRY WITH REGARD TO OUCH-OUCH DISEASE AND ITS CAUSES (ANNEXED MATERIALS). *(Itai-itaibyi to sono gen in ni kansuru koseisho no kenkai (fuzoku shiryo)). Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 125-148, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 38p.*

The occurrence of Itai-itai disease and cadmium, the substance responsible for its occurrence, are discussed. The essential nature of the disease is described as chronic cadmium poisoning with damage to the re-absorbability of the renal tubules, which then results in a calcium imbalance in the body due to calciprivia, followed by osteomalacia. Woman who are at or past their menopause are especially prone to the disease; in particular, those who have lived in the region of the outbreak for more than thirty years and have conceived many times. A historical survey of the outbreaks of this disease and of the cadmium poisoning theory are presented. The sources of cadmium are reviewed, in patients, food and drinking water, in soil, and in the main stream of the Jinzu River. It was determined that cadmium accumulates in the kidneys and bones of the body after ingestion of food and water contaminated by cadmium. Cadmium present in the Jinzu River is due to waste discharge from industrial activities, specifically from refineries. Future countermeasures to prevent another outbreak of the disease are suggested, including continuing medical treatments, instituting health insurance, installing waste treatment facilities at refineries, and continued monitoring of air, water and soil to measure cadmium concentrations.

29643 **APTIC NO. 51067**

Ministry of Health and Welfare (Japan)

OPINION OF THE WELFARE MINISTRY WITH REGARD TO ITAI-ITAI DISEASE (OUCH-OUCH DISEASE) IN TOYAMA PREFECTURE. *(Toyama-ken ni okeru Itai-itaibyo ni kansuru koseisho no kenkai). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 115-120, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 9p.*

The occurrence of Itai-itai disease in the Toyama Prefecture and the role of cadmium in its development is discussed. The disease follows the process in which kidney disorder is caused by chronic cadmium poisoning accompanied by osteomalacia. Factors inducing the disease include pregnancy, sucking, endocrinosis, geromarasmus, and nutritive-calcium deficiency. The disease is found only in a particular area of the Jinzu River basin. Neither contamination by cadmium nor occurrence of the disease in other basin areas was found. Cadmium has long polluted the area, and ingestion and absorption of the metal by residents through foodstuffs and water, with parts of the absorbed cadmium accumulating in internal organs (kidneys) and in bones, lead to the inhabitants being attacked with the disease which had passed into a chronic state during the years. Measures to prevent future occurrence of the disease are suggested.

29644 **APTIC NO. 51069**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Dept.

ON THE REVISION OF ONE PART OF THE ESSENTIALS OF TENTATIVE COUNTERMEASURES AGAINST ENVIRONMENTAL POLLUTION BY CADMIUM (SYSTEM FOR HEALTH CHECKS ON INHABITANTS). *(Kadomyumu kankyo osen zantei taisaku yoryo no ichibu jumin kenko chosa hoshiki (Kaisei ni tsuite)). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 81-108, March 1972. 3 refs. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa 50p.*

Revisions of the system for health checks of inhabitants in areas observed for cadmium pollution are presented. Three series of examinations were conducted on all inhabitants in the designated area, 30 years or older; on inhabitants showing more than (plus) urine protein in the first examination; and on inhabitants having more than 30 micrograms/l of urine cadmium and patterns of characteristic tubular disturbance, or less than 30 micrograms/l of urine cadmium with patterns characteristic of tubular disturbance. The items to be investigated and examined in each series are listed. Summary questionnaire forms used in the investigations are given, both for groups and individuals. The standard method for the determination of cadmium in the urine is described, and the procedures for disc electrophoresis discussed. Recording methods for all forms are explained.

29645 **APTIC NO. 51194**

Ahmed, A. Karim, Donald F. MacLeod, and James Carmody

CONTROL FOR ASBESTOS. *Environment, 14(10):16-22, Dec. 1972. 45 refs.*

The properties of commercially used asbestos fibers are described together with studies documenting the effects of the fibers on the health of asbestos workers and the general population. Between 1943 and 1971, 421 deaths occurred among asbestos workers in New York and New Jersey where only 280 deaths were expected. The excess deaths were caused by higher-than-usual incidences of lung cancer, mesothelioma (a cancer of the pleura and peritoneum), cancer of the gastrointestinal tract, and asbestosis. Nonoccupational exposure to asbestos has been linked with pleural calcification, but the most serious hazard is the occurrence of diffuse mesothelioma of the pleura and peritoneum. In an asbestos-producing area of South Africa, only 12 of 89 diagnosed cases of mesothelioma had direct industrial exposure to asbestos. Present Occupational Safety and Health Act standards do not apply to the cancer-inducing properties of asbestos and do not take into account chronic exposure of human beings to low levels of asbestos. However, the Environmental Protection Agency, following the lead of New York City, Chicago, Boston, Philadelphia, and the state of Illinois, has proposed standards that should effectively prohibit the spraying of asbestos-containing material at all new construction sites and the visible emission of asbestos particulate matter during repair and demolition.

29646 **APTIC NO. 51458**

Albert, R. E. and M. Lippmann

FACTORS INFLUENCING DUST RETENTION IN THE PULMONARY PARENCHYMA. PART II. MECHANISMS OF DISEASE. *Ann. N. Y. Acad. Sci., vol. 200:37-45, Dec. 29, 1972. 13 refs.*

To obtain estimates of the range of alveolar deposition of coal and quartz dust by miners, 70 subjects were exposed to ferric oxide aerosols tagged with technetium and gold. Retention of the tagged particles was measured by gamma ray detectors viewing the head and chest in a whole body counter. Alveolar deposition, as determined the ratio of chest radioactivity at 24 hr to that initially present after inhalation, decreased rapidly with increasing particle size above 5 micron. There was considerable intersubject variation in alveolar deposition due to the combined variability in tracheobronchial penetration and alveolar deposition. Both head and alveolar deposition data were used to calculate the extent of intersubject variation in alveolar deposition for coal mine aerosol described in the literature. The results show a five-fold difference in the amount of daily alveolar deposition of coal, i.e., from 10-50 mg. Most of this difference is accounted for by particles between 5-10 micron. A two-fold range exists for quartz. These marked individual differences suggest that effective penetration of particles into the alveoli may have a bearing on susceptibility to pneumoconiosis among miners.

29647 **APTIC NO. 51074**

Antonovich, Ye. A., O. V. Chernov, L. V. Samosh, L. V. Martson, M. A. Pilinskaya, L. I. Kurinnyy, M. Sh. Vekshteyn, V. S. Martson, P. N. Balin, and I. I. Khitsenko

A COMPARATIVE TOXICOLOGICAL EVALUATION OF DITHIOCARBAMATES. *(Sravnitel naya toksikologicheskaya otsenka ditiokarbamatov). Gigiena i Sanit., vol. 37, p. 25, Sept. 1972. 4 refs. Translated from Russian, 10p.*

A series of studies of the toxicological effects of dithiocarbamates on rats is presented and the effects of dimethyl and ethylene-bis-dithio-carbamic acids, tetramethylthiuram disulfide (TMTD), and cirame were evaluated. Changes were observed in the morphological condition of blood and the functional condition of the liver after administration of TMTD; disturbances were also noted in the enzyme system, and structural changes were seen in organs and tissues. Prolonged treatment with TMTD and cirame in comparatively small amounts (1-10 mg/kg) lead to chronic poisoning. Dithiocarbamates accumulated in the liver, kidneys, heart, spleen, brain, stomach and intestinal walls, muscles, adrenals, pancreas, thymus and sex glands. Maximum accumulation of pesticides was noted in the endocrine system. All pesticides also had an embryotoxic effect which was expressed in resorption of fetuses, high litter mortality, low newborn weight, and retardation of postnatal development. The effect of cineb, cirame, maneb, and TMTD on chromosomes of human and animal somatic cells in tests in vitro and in vivo were studied. The number of cells with damaged chromosomes was noted.

29648 **APTIC NO. 51469**

Baskervill, Robert D.

INTERNAL LARYNGEAL INJURY IN CHILDREN DUE TO INGESTION OF ATMOSPHERICAL TOXIC AGENTS. *J. School Health, 42(7):377-379, Sept. 1972. 2 refs.*

The purpose of this paper is to focus on the problem of air pollution and to show how toxic pollutants could possibly affect normal voice production of children in such an environment. An attempt is made to provide a rationale for therapy for those children who are unable to be permanently or even temporarily removed from an environment where there is excessive emission of toxic pollutants. The relationship of air pollution to upper respiratory diseases is outlined. It is felt that a great deal of additional study is needed to prove or disprove that air pollution is a major cause of internal laryngeal injury in children. It is felt that it may be necessary to have lobby groups formed by the para-medical and educational professional associations to enact stronger legislation for the reduction of pollution.

29649 **APTIC NO. 51111**

Cheftel, H. and L. Truffert

TRACE ELEMENTS AND THEIR TOXICITY IN HUMAN NUTRITION. *(Oligo-elements et leur toxicite dans l alimentation de l homme). Ann. Nutr. Aliment., 26(Supplment B):521-532, 1972. 18 refs. Translated from French, 19p. (Complete text not available.)*

Human nutrition with respect to trace elements and their toxicity was studied. The trace elements essential to man include iron, iodine, copper, zinc, manganese, magnesium, cobalt, molybdenum, and selenium. These elements are essential to maintain the chemical balance within the human organism. Doses above the minimum daily requirement within limits, are either stored in the body in different forms or excreted as a function of normal metabolism.

29650 **APTIC NO. 51269**

Cortes, Reto and O. S. Privett

TOXICITY OF FATTY OZONIDES AND PEROXIDES. *Lipids, 7(11):715-721, Nov. 1972. 44 refs.*

Acute toxicity of the ozonides and hydroperoxides of methyl linoleate was studied. High purity preparations of these compounds were injected intravenously or administered orally to adult male rats. The lethal dose by intravenous injection was virtually the same for all compounds -- 0.07 mmol/100 g body weight. No deaths were caused in a 24-hour period by single oral dosages. The major effect of these compounds was on the lungs. The lungs became enlarged from edema and accumulation of fluid, and the animals died of lung conjestion and injury similar to the effects of ozone toxicity. There was no destruction of vitamin E In the tissues of animals given lethal dosages of ozonides or peroxides intravenously, but significant changes occurred in fatty acid composition of the lipids of the serum and lung. Arachidonic acid increased at the expense of linoleic and oleic acids in these tissues. Only small amounts of peroxidic and TBA positive substances were detected in the lungs and serum, indicating that the injected ozonides and hydroperoxides were destroyed in the tissues. (Author abstract)

25551 **APTIC NO. 51250**

Egan, Joan, F. C. Tring, and R. E. S. Prout

TETRACYCLINE DEPOSITS IN CHILDREN S TEETH IN RELATION TO ATMOSPHERIC POLLUTION. *Brit. J. Prevent. Soc. Med. (London), 26(4):259-262, 1972.*

To see if the pattern of tetracycline administration has changed since the adverse effects of the drug became widely known and to compare the levels of tetracycline deposits in the teeth of children living in two towns with significant differences in their levels of atmospheric pollution, tetracycline deposits in teeth were measured. The level of tetracycline deposits remained high, but there was a decline from a peak incidence occurring in 1960-1965. The major difference between the two groups of chlidren surveyed concerned their different environments. Rotherham had a very high level of atmospheric pollution by smoke and sulfur dioxide. Although this level of pollution is slowly being reduced, it is high and compares unfavorably with Northallerton where there is minimal atmospheric pollution. Environmental factors may exert a significant influence on the level of tetracycline administration is suggested.

29652 **APTIC NO. 51257**

Giacomelli-Maltoni, Giuseppina, Carlo Melandri, Vittorio Prodi, and Giuseppe Tarroni

DEPOSITION EFFICIENCY OF MONODISPERSE PARTICLES IN HUMAN RESPIRATORY TRACT. *Am. Ind. Hyg. Assoc. J., 33(9):603-610, Sept. 1972. 9 refs.*

The total deposition of a solid monodisperse aerosol along the human respiratory tract was investigated. The particles were solid spheres at body temperature and ranged within 0.2-2 micron in diameter, with a geometric standard deviation of less than 1.1. The deposition efficiency was assessed by photometric measurement of light scattering at 90 deg in the inhaled and exhaled air. Deposition was measured at constant respiratory frequency, tidal volume, and spontaneous respiration conditions. In the lower part of the size range, i.e., below 0.5 micron, practically all the particles deposited in the pulmonary region. Above 0.5 micron, deposition significantly increased with tidal volume. (Author abstract modified)

29653 **APTIC NO. 51368**

Gurina, G. P.

ESTIMATION OF THE LUNG DIFFUSION ABILITY BY THE METHOD OF HOLDING THE BREATH. *(Opredeleniye diffuzionnoy sposobnosti legkikh metodom zaderzhki dykhaniya). Text in Russian. Fiziol. Zh. SSR, 58(5):793-795, 1972. 13 refs.*

The value of the breath-holding technique as applied for the estimation of the lung diffusion of carbon monoxide was studied in clinical tests on healthy persons. The test equipment included a spirograph, rubber bags for alveolar gas sampling, an automatic control unit, a heat-conduction helium analyzer, and an infrared analyzer for CO. The inhaled gas mixture contained 0.25-0.28% CO and 14% helium. The test persons were asked to hold their breaths for 10 sec after deep inhalation. The lung diffusion was calculated from the alveolar CO partial pressure taken before and after breath holding, the duration of breath holding, and the pulmonal air volume during breath holding. The CO diffusion in the lung ranged from 15 to 40 ml/min Hg mm. The lung diffusion was greatest in the 18-35 yr age bracket, and showed differences as a function of age and sex in conformity with Burrows formulae. The breath holding method constitutes a reproducible, simple technique for physiological investigations.

29654 **APTIC NO. 51684**

Hopfield, J. J., S. Ogawa, and R. G. Shulman

THE RATE OF CARBON MONOXIDE BINDING TO HEMOGLOBIN KANSAS. *Biochem. Biophys. Res. Commun., 49(6):1480-1484, Dec. 18, 1972. 11 refs.*

Recent experiments indicated that the two state Monod, Wyman, and Changeux (MWC) model could explain the increase of the carbon monoxide rate constant during the reaction with hemoglobin A on the basis of a switch from the slowly reacting T form the rapidly reacting R form. In hemoglobin Kansas, a cooperative mutant, the lower affinity suggests that the switch occurs much later than in Hb A, so that the MWC model would predict an almost constant rate. This was confirmed by stop flow spectrophotometric measurements on Hb Kansas at pH 7.0 and 20 C in O.1 M phosphate. The increase of the rate constant was less than 5% in going from zero to 80% saturation in contrast to Hb A where the observed increase was almost a factor of two. (Author abstract modified)

29655 **APTIC NO. 51223**

Horita, Yasuo

AN INTRODUCTION TO POLLUTION AND BIOLOGY. (NO. 3). *(Kogai seibutsugaku nyumon). Text in Japanese. Kagaku to Yakugaku no Kyoshitsu (Chem. Pharm., Quart. J.), no. 36:14-20, 1972. 9 refs.*

The environmental factors that affect the human life span and human aging are discussed. As one factor that plays an important role in human aging, pollution affects the health of the human beings, animals, and plants. DDT is biologically and chemically analyzed in detail.

29656 **APTIC NO. 51224**

Horita, Yasuo

AN INTRODUCTION OF POLLUTION AND BIOLOGY. (NO. 4). *(Kogai seibutsugaku nyumon). Text in Japanese. Kagaku to Yakugaku no Kyoshitsu (Chem. Pharm., Quart. J.), no. 37:33-39, 1972. 7 refs.*

Agent Orange, Agent Purple, Agent White, and Agent Blue, which were used militarily in the Vietnam War are discussed. Three classifications of herbicides are: the contact type herbicide which covers the total surface of the leaves and causes suffocation, or infiltrates into cells and causes metabolic disorders; the transportation type of herbicides which transports the chemical absorbed through leaves and roots into the entire system through veins; and the soil sterilization type which changes soil ions. The chemical structures of these types are discussed. The spray of herbicides causes pollution of air, soil, water, and food by residue. The toxicity of herbicides on the human body is discussed based on biological tests and animal experiments.

29657 **APTIC NO. 51371**

Hyde, H. A.

ATMOSPHERIC POLLEN AND SPORES IN RELATION TO ALLERGY. I. *Clin. Allergy, 2(2):153-179, June 1972. 198 refs.*

The magnitude of seeds produced by an Agaric or a Boletus is innumerable. Plant spores in the widest sense are found in all divisions of the plant kingdom, but only those formed by the flowering plants and the fungi contribute significantly to the aerospora. A re-statement based on the study of Thommen is presented. The pollen or other spore type contain an excitant of hayfever or asthma. The spore must be produced in sufficiently large quantitites; the spores must be sufficiently buoyant to become airborne; and the plant species concerned must be widely and abundantly distributed. Technical methods for the surveys of pollen and spores are described. Pollen and spores in Great Britain are reported. Most types of pollen grains and spores vary more or less widely in their abundance from year to year. The variations are attributable only in part to concurrent weather. Pollen activity is largely confined to the first half of the year, the fungus spore band is significant all the year round, especially from late spring until November. A place right on the seashore might be expected to experience low average spore concentrations.

29658 **APTIC NO. 51307**

Ichinosawa, Ako and Hajime Yamabayashi

AIR POLLUTION AND RESPIRATORY DISEASES-- FROM THE STANDPOINT OF PULMONARY FUNC-

TION. (Taiki osen to kokyuki shikkan--hai kino no tachiba kara). Text in Japanese. Hai to Shin (Lung Heart), 19(1):9-19, 1972. 44 refs.

Epidemiological studies of air pollution and respiratory diseases are reviewed. The irritants and their effects specifically discussed in detail are sulfur dioxide, nitrogen dioxide, and ozone. Sulfur dioxide causes an increase of pulmonary resistance, a decrease of compliance, and an increase of the lung artery pressure. Nitrogen dioxide causes fluctuation of pulmonary resistance, increase of mortality, and disorders of compliance lung oxygen diffusion. The toxicity of ozone is 10 to 15 times greater than NO2, and 3 ppm concentration can cause bleeding of the lung and emphysema in several hours. A sporadic exposure to high concentration of ozone causes lung fibrosis, and a continuous exposure to low concentration causes quick breathing and the increase of oxygen consumption. An exposure to 0.6-0.8 ppm ozone for 2 hr can decrease the lung oxygen diffusion ability. The effects of particulates, synergism, and sources are mentioned.

29659 **APTIC NO. 51704**

Jaunarajs, Karlis L. and Richard S. Liebling

THE DIGESTION OF LUNG TISSUE FOR MINERAL DUST RECOVERY. *Am. Ind. Hyg. Assoc. J., 33(8):535-542, Aug. 1972. 14 refs.*

Methods for the recovery of inhaled mineral dusts from lung tissue with minimal physical damage are suggested. Clorox solution, hydroxide of hyamine, and hydrogen peroxide were considered for digestion of lung tissue. Contact of these reagents with a group of mineral (quartz, chrysotile, amosite, and calcite) revealed that Clorox solution and Hydroxide of Hyamine have the least effect on the minerals. Coal dust was more easily separated from Clorox than from the Hydroxide of Hyamine reagent in digestions of lung tissue containing particles of coal, clay, and mica. However, Clorox solution was not suitable for extraction of coal dusts, because of apparent oxidation. Both reagents seemed unreactive with the clay and micas. Preliminary tests involving low-temperature (less than 200 deg C) ashing of lung tissue in oxygen-plasma indicated that this method could be suitable for recovery of certain minerals. (Author abstract)

29660 **APTIC NO. 51572**

Leadbetter, Mark R. and Morton Corn

PARTICLE SIZE DISTRIBUTION OF RAT LUNG RESIDUES AFTER EXPOSURE TO FIBERGLASS DUST CLOUDS. *Am. Ind. Hyg. Assoc. J., 33(8):511-522, Aug. 1972. 11 refs.*

The particle size distribution of lung residues in rats after exposure to fiberglass dust clouds containing particulates less than 3.9 micron in aerodynamic equivalent diameter was investigated. Pulmonary clearance mechanisms were independent of the fiber diameters in the size range 0.28-1.10 micron. Glass fibers with lengths up to 3 micron were cleared at the same rate without regard to postexposure time or to the presence of absence of emphysema. For up to 6 mo postexposure, fiber lengths below 4 micron were cleared at a more rapid rate than fibers of greater length. (Author conclusions modified)

29661 **APTIC NO. 51115**

Neyman, I. N.

THE POSSIBILITY OF DETERMINING MAXIMUM DOSES OF CARCINOGENIC SUBSTANCES. *(O vozmozhnosti opredeleniya predelnykh doz kantserogennykh veshchestv). Gigiena i Sanit., 37(5):90-93, May 1972. 20 refs. Translated from Russian, 8p.*

The problem of defining maximum limits for carcinogenic substances is examined. The dose-effect relationship, the mechanism of the effect on tissues, tumor development, and toxicity are reviewed with respect to the carcinogenic potential of polycyclic aromatic hydrocarbons.

29662 **APTIC NO. 51609**

Pfleger, R. C., Rogene F. Henderson, and J. J. Waide

COMPARISON OF LUNG COMPONENTS FROM VARIOUS SPECIES. *In: Annual Report of the Fission Product Inhalation Program. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., p. 262-267, Nov. 1972. 4 refs.*

NTIS: LF-45

A comparison of the neutral lipid and phospholipid composition of pulmonary tissue surfactant and exfoliated lining cells from the lungs of four mammalian species -- dog, horse, sheep, and hamster -- was made. The amount and the composition of lipid present in both lung tissue and surfactant from the four species were very similar. A species difference was observed in the lipid content of the pulmonary lining cells. The neutral lipid composition of pulmonary tissue showed a consistent pattern between species yet individual variability was evident. Large differences between species were observed in the neutral lipid composition of pulmonary surfactant. In pulmonary tissue, phosphatidyl choline (PC), phosphatidyl ethanolamine, and sphingomyelin were the major phosphatides; in pulmonary surfactant, PC and phosphatidyl glycerol accounted for about 81% of the phospholipid-P from all four species. The surfactant phospholipid composition form all species was similar though the phospholipid-P profiles from the pulmonary lining cells appeared quite different. The interspecies similarities and differences in the lipid profiles were discussed. (Author abstract)

29663 **APTIC NO. 51594**

Planteydt, H. T.

ASBESTOS AND MESOTHELIOMA IN THE NETHERLANDS. *TNO-Nieuws, 27(11):667-671, Nov. 1972. 7 refs.*

In a statistical study of lung cancer incidence in the Netherlands, all histologically verified cases of mesothelioma of the pleura and peritoneum were registered starting from Jan. 1969, and the data were compared with mortality figures. The relationship between asbestos and mesothelioma was specifically studied. The cases were registered according to geographical distribution, age, and sex. Lung tissue sections were studied to determine the presence or absence of asbestos particulates. In the mesothelioma cases, chrysotile was always determined in the slides of the tissues. The occurrence of cases of mesothelioma was also closely correlated with harbors and shipyards, indicating asbestos as the most probable etiological agent.

29664 **APTIC NO. 51588**

Rao, C. R. S.

BIOLOGIC EFFECTS OF ATMOSPHERIC ASBESTOS. *Indian Eastern Engr. (Bombay), 114(11):653-654, 657, Nov. 1972.*

The composition, uses, and hazards of asbestos are reviewed. The toxicity of asbestos inhaled in occupational or other exposures is manifested as pulmonary fibrosis, lung cancer, and asbestosis. The different types of asbestos and the related pathogenicity, the carcinogenic character, and the hazards of atmospheric asbestos are discussed.

29665 **APTIC NO. 51467**

Schmelzer, Uwe, Rudolf Steiner, Adalbert Mayer, Teja Nedetzka, and Hugo Fasold

ON THE KINETICS OF THE REACTION OF HEMOGLOBIN WITH CO. FLASH- PHOTOLYSIS EXPERIMENTS. *Eur J. Biochem., 25(3):491-497, Feb. 29, 1972. 23 refs.*

Flash-photolysis measurements were performed on normal and on chemically modified human adult hemoglobin solutions in the concentration range between 1 to 100 micro (for complete molecule) and in the pH range between pH 5 and pH 9. The energy of the irradiating flash was varied continuously from 20 to 400 Joules. The fast reaction observed after complete or partial flash photolysis was pertinent both to dimeric hemoglobin molecules and to tetrameric hemoglobin molecules which are locked in the state of quaternary structure corresponding to completely liganded hemoglobin. The observed data suggested that an all-or-none transition of the quaternary structure of hemoglobin accompanies the third step of the ligation process. (Author abstract)

29666 **APTIC NO. 51088**

Toger, N. V.

SOME INDICES OF THE METABOLISM OF COPPER, ZINC AND THE METALLO- PROTEINS COMBINED WITH THEM IN SCLEROMA PATIENTS. *(Nekotorye pokazateli obmena medi, tsinka i sopryazhennykh s nimi metalloproteidov u bolnykh skleromoy). Zh. Ushn. Nos. Gorl. Bol., 32(4):96-101, July/Aug. 1972. 25 refs. Translated from Russian, 12p.*

The copper and zinc contents in the plasma, blood elements, and urinary excretions with respect to the dynamics of treatment of scleroma patients were examined. The activity of blood ceruloplasmin and carbonic anhydrase, which contain copper and zinc as structural components, was also studied. The contents of the trace elements in plasma, blood, and urine decreased before treatment and did not normalize after treatment. A direct dependence was established between the concentration of the trace elements and the activity of the metallo-proteins combined with them and between changes in copper concentration and shifts in the level of zinc in the blood.

29667 **APTIC NO. 51286**

Ulrich, Ladislav, Elemir Malik, and Alfons Juck

INVESTIGATION OF THE DUST EFFECT ON THE RESPIRATORY APPARATUS IN AGRICULTURAL WORKERS. *(Skumanie ucinkov prachu na respiracny aparat polnohospodarov). Text in Czech. Pracovni Lekar. (Prague), 24(8):288-295, 1972. 24 refs. (Presented at the All- Union Congress on Occupational Medicine, 12th, Nitra, Czechoslovakia, September 1971.)*

The effects of dust on the respiratory tract of agricultural workers were investigated with respect to the formation and development of injuries and types of dusts, based on an epidemiological study of agricultural workers. The first symptoms related to the effects of agricultural dusts included bronchospastic reactions and temporary decreases of some pulmonary functions. With repeated exposure to the dusts, the symptoms were aggravated, leading to chronic inflammations of the bronchial mucosa.

29668 **APTIC NO. 51240**

Yamamoto, Takeo

POLLUTION AND THE RELATED FIELDS (III): ENVIRONMENTAL POLLUTION AND METALS. *(Kogai to sono shuhen (III): Kankyo osen to kinzoku). Text in Japanese. Kagaku to Yakugaku no Kyoshitsu (Chem. Pharm., Quart. J.), no. 37:12-19, 1972. 4 refs.*

One of the major air pollutants is particles of metal fumes created by combustion and metal industries. The metals in the air are taken into humans, animals, or plants by respiration. Metal particles also act as catalysts to pollutant gases; they accelerate the formation of oxide or peroxide, and by the same token, metal pollutants act as catalysts in the human body. When one group of experimental animals exposed to sulfur dioxide is exposed to particles of manganese, the symptoms worsen drastically compared to the groups exposed to SO2 or Mn singly. The metal content in the atmosphere in main cities of Japan and in one American city and one English city are presented in tables. Metals discussed include cadmium, lead, zinc, copper, cobalt, iron, manganese, nickel, tin, vanadium, aluminum, silver, and chromium.

1971

29669 **APTIC NO. 51056**

Japan Public Health Assoc.

STUDIES ON THE STANDARDIZATION OF ANALYTICAL METHODS FOR CHRONIC CADMIUM POISONING - REPORTS OF INVESTIGATIONS IN 1970. *(Kadomyumu chudokusho to ni kansuru bunsekiho no hyojunka ni kansuru kenkyu - Showa 45 nendo kenkyu hokoku). 67p, March 1971. 3 refs. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 149p.*

Studies on the standardization of analytical methods for chronic cadmium poisoning, the determination of cadmium concentration in urine, manual operations in the method of disc electrophoresis for urinary protein, and operations for determining protein are presented. Methods, procedures, and equipment for determining cadmium in urine, analyzing urinary protein ankd sugar, and quantitative determinations of urinary protein and amino acids are described. A table of cross-checked analytical data for cadmium is presented. The effect of the quantity of urine used on the analytical values for cadmium; investigations on various acids for back extraction, comparative studies of methods for determining total amino acids in urine, investigations on the gel filtration and disc electrophoresis methods for urinary protein, and protein patterns are reviewed.

29670 **APTIC NO. 51480**

Ethyl Corp., New Orleans, La., Medical Dept.

A CONSIDERATION OF THE PUBLIC HEALTH ASPECTS OF MANGANESE IN THE ENVIRONMENT. *Preprint, 3p., Sept. 1971.*

Based on existing data from surveys and knowledge of manganese in the environment, manifestations of a toxic effect will not result from environmental contact (exclusive of high industrial exposures) derived from natural occurrence of manganese or through use of an organic compound, methylcyclopentadienyl manganese tricarbonyl, designed as a smoke suppressent or gasoline additive. At power stations using the compound as a smoke suppresant for stack emissions, air concentration 1000 ft downwind was 0.1-0.2 micrograms/cu m compared with a background level of 0.01-0.02 micrograms/cu m. At a site where fuel oil contained 125 ppm, air concentrations 1500 ft downwind were 0.03-0.05 micrograms/cu m compared with a background level of 0.02 micrograms/cu m. The human body, as well as other animal organisms and plants, has a tremendous capacity to handle and dispose of excess amounts of manganese present in the environment. The amount received through air is cleared or absorbed and handled normally since there is no accumulation in lungs with age. Neither is there accumulation in other organs with age and the body pool is remarkably constant in light of vast dietary differences (2-20 mg manganese/day). A pneumonia-like condition or central nervous effects similar to Parkinsonism result only from industrial exposures of very high intensity over long periods of time. For the average worker, the threshold value of 5 mg/cu m would result in a daily dose of 50 mg or more.

29671 **APTIC NO. 51650**

Edgerley, Robert H.

SUPPLEMENTAL INFORMATION ESTIMATING CARBON MONOXIDE EXPOSURE. *North American Rockwell Corp., MSC-17211, 17p., National Aeronautics and Space Administration TSP71-10319, 1971 (?). 38 refs.*

Effects of carbon monoxide are discussed. Carbon monoxide combines with hemoglobin of the blood to reduce the oxygen capacity of the blood to that of plain water. With all of the Hb combined with CO, the oxygen capacity drops from about 21 standard cu cm of oxygen/100 cu cm of blood to only about 0.5 cu cm. The cause of death due to CO exposure is consequently the result of a deficient oxygen supply to the tissues of the body. Physiological effects of carboxyhemoglobin are tabulated. It is noted that the effects of CO to produce hypoxia or lack of oxygen are additive with other causes of hypoxia, and this includes increased oxygen demands of the body caused by exertion. Death can be caused in otherwise healthy persons at carboxyhemoglobin concentration as low as 40%.

29672 **APTIC NO. 51265**

Emara, A. M., I. Waguith, S. El-Gendi, and G. H. El-Samra

CARBON MONOXIDE HAZARD IN CAIRO TRAFFIC. *J. Egypt. Med. Assoc., 54(10):714-722, 1971. 35 refs.*

An evaluation of carbon monoxide hazards in Cairo due to traffic exhaust is presented. The carboxyhemoglobin levels of 44 different traffic policemen from different zones of Cairo, exposed to exhaust from motor vehicles, were measured using ultraviolet spectrophotometry. Besides smoking habits, the mode of exposure to traffic exhaust influenced carboxyhemoglobin levels. The CO was also estimated in the air of five different zones of Cairo and its concentration was related to the nature of the traffic with regard to the streets, surroundings, and traffic load. Carboxyhemoglobin levels were related to CO concentrations in the atmosphere. (Author summary modified)

29673 **APTIC NO. 51035**

Gautreaux, M. F.

INFORMATION FOR THE NATIONAL RESEARCH COUNCIL CONCERNING METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL. *Preprint, Ethyl Corp., Detroit, Mich., Research Labs., 8p., Oct. 28, 1971. 10 refs.*

The background, state of knowledge, and perspective concerning methylcyclopentadienyl manganese tricarbonyl (MMT) to present and potential considerations for manganese in the environment are discussed. The MMT is used as improver in boiler and turbine fuels and as a antiknock in gasoline. The consequences of interaction between manganese oxide and other components of the environment such as sulfur dioxide are discussed. The current discharge of manganese into the air by the uses of MMT is very small part of the total manganese, and only a fraction of it enters the air. Manganese is an essential and omnipresent element. The human body and other animal organisms and plants have tremendous capacity to handle and dispose of excess amounts which may be present in the environment. Toxic effects will not result from any reasonably foreseeable environmental contact (exclusive of high industrial exposures) derived either from natural occurrence of manganese or through use of an organic compound.

29674 **APTIC NO. 51112**

Leube, G. and H. Kreiter

ACUTE CHLORINE GAS POISONING. OBSERVATIONS ON 90 PATIENTS WITH ACUTE INTOXICATION. *(Akute Chlorgasvergiftung. Beobachtungen bei 90 Patienten mit akuter Intoxikation). Med. Klin. (Munich), 66(10):354-357, 1971. 6 refs. Translated from German, 11p.*

The clinical and laboratory findings, symptoms, and treatments involved in the acute chlorine gas poisoning of 90 persons are examined. The clinical picture is characterized by irritative cough, dyspnoea, retrosternal pain, nausea, vomiting, headaches, and a feeling of vertigo. Ten patients evidenced signs of a beginning pulmonary edema. Almost all of them showed leukocytosis immediately after the poisoning, to maximum values of 26,500/cu mm. Increased enzyme activity was also determined in several cases.

29675 **APTIC NO. 51319**

Scarpelli, E. M.

PHYSIOLOGY AND PATHOLOGY OF PULMONARY SURFACTANTS. *Triangle, 10(2):47-56, 1971. 49 refs.*

The surfactant system resides within the ultramicroscopically thin, acellular lining layer that covers the alveolar epithelical cells of mammalian lungs. It consists of proteins, carbohydrates, and phospholipids. The physiological importance of pulmonary surfactants has been assumed from in vitro measurements or estimations of surface tension. The stability theory states that as alveolar surface area decreases, surface tension falls toward zero so that at small volumes tension is negligible force. Implicit in this argument is the possibility that tension varies directly with area so that the net surface force, which tends to promote alveolar collapse is similar among alveoli of different sizes, and thus the tendency of small alveoli to empty into larger ones is obviated. The maintenance of near-zero surface tension in the alveoli requires a continuous supply of phospholipids.

29676 **APTIC NO. 51185**

Suzuki, Tsuguyoshi, Taiichiro Takemoto, Hinako Shimano, Tomoyo Miyama, Haruo Katsunuma, and Yoshiko Kagawa

MERCURY CONTENT IN THE BLOOD IN RELATION TO DIETARY HABIT OF THE WOMEN WITHOUT ANY OCCUPATIONAL EXPOSURE TO MERCURY. *Ind. Health (Japan), 9(1/2):1-8, July 1971. 22 refs.*

The dietary record of 15 women with no record of occupational exposure to mercury was studied, and the data were correlated with the mercury content in the red cells and plasma by regression analysis. Only the intake of fish, mainly marine, was significant in determining the mercury level in red cells and explained 80% of the total variance. No significant correlation and regression coefficients were determined for the mercury level in plasma. (Author abstract modified)

29677 **APTIC NO. 51342**

Suzuki, Yasutomo and Hiroshi Yoshikawa

INTRACELLULAR DISTRIBUTION OF CD, CU AND ZN IN CD POISONED RAT LIVER PRETREATED WITH AND WITHOUT HG. *Ind. Health (Japan), 9(4):198-201, Dec. 1971. 10 refs.*

Cadmium, copper, and zinc content was studied in livers of rats injected with Cd only and with Cd after administration of a small amount of mercury. Intracellular distribution of these metals in livers was also studied. Three groups of six Sprague Dawley male rats weighing 440 to 520 g were used. The liver and its four fractions were analyzed for Cd, Cu, and Zn with an atomic absorption spectrometer, after being digested with concentrated nitric acid and hydrogen peroxide. The mechanism of the change of the metal distribution in the liver is not clear. The high Cd content and the remarkable change in Zn and Cu content in the supernatant fraction may be connected with the metallothionein, which is a low molecular weight protein existing in supernatant fractions of kidney and liver, binding Cd, Zn, Cu, and Hg.

1970

29678 **APTIC NO. 51097**

Eybl, V., J. Sykora, and F. Mertl

INFLUENCE OF THE CALCIUM COMPLEXES OF THE AMINOPOLYCARBOXYLIC ACIDS ON THE EXCRETION AND DISTRIBUTION OF ZINC. *(Einfluss der Ca-Komplexe der Aminopolycarbonsaeuren auf der Ausscheidung und die Verteilung des Zinks). Z. Gesamte Exp. Med., vol. 152:274-283, 1970. 24 refs. Translated from German, 12p.*

The effect of the calcium complexes of the aminopolycarboxylic acids on the excretion and distribution of zinc after its application and the effect of the chelating agents were examined in experiments with rats. The chelating agents applied simultaneously with zinc chloride increased the excretion of zinc into the urine and decreased the excretion of zinc into the feces. The total amount of zinc excreted from the organism was increased. The relative activity of the various aminopolycarboxylic acids was determined.

29679 **APTIC NO. 51092**

Faure, J., M. Sibille, H. Faure, C. Stephan, M. Yacoub, and J. Motin

ACUTE POISONING BY CHLORINE AND PHOSGENE. A CLINICAL AND EXPERIMENTAL STUDY. *(L intoxication aigue par le chlore et le phosgene. Etude clinique et experimental). Poumon Coeur (Paris), 26(8):913-929, 1970. 36 refs. Translated from French, 23p.*

Poisoning by chlorine and phosgene inhalation was investigated with respect to the clinical aspects, symptoms, biologic effects, pulmonary radiography, functional respiratory changes, blood chemistry, diffusion capacity, diagnosis, pathologic anatomy, and treatment. Chlorine gas toxicity affects exclusively the respiratory system. Classically, the symptoms include dyspnea, emphysema, bronchial dilatation, abscesses, pulmonary sclerosis, tuberculosis, and asthma. The results of experimental poisonings of guinea pigs are reviewed and compared with results in extant literature.

29680 **APTIC NO. 51473**

Paluch, J. and I. Szalonek

POLLUTION ON THE AIR BY FLUORINE COMPOUNDS. *(Zanieczyszczenie powietrza zwiazkami fluoru). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(5):1-11, 1970. 6 refs. (Presented at the French-Polish Symposium on Air Pollution Control, Paris, France, Nov. 17-21, 1969.)*

NTIS: TT 70-P55124/5

The contribution of fluorine compounds to the general problem of air pollution and the physiological effect of fluorine pollutants on vegetation, man, and animals are examined. The outward symptoms of fluorine poisoning in plants are generally a typical necrosis of the tips and edges of leaves and eventual destruction of the assimilating apparatus, depending on intensity of exposure. The toxicology of the fluorine ion with respect to human beings and animals is connected primarily with changes in the body disposition of calcium and iodine. The external disease symptoms in animals include thickening and formation of nodes on long leg bones, ribs, and joints, leading to lameness; lack of appetite; stiffness. The human organism is more susceptible to fluorine poisoning than animal organisms; the toxic effects in humans are manifested as fluorosis. Emission sources and types of exposure are examined.

29681 **APTIC NO. 51471**

Rzepka, J.

AIR POLLUTION AND THE POPULATION S HEALTH CONDITION. *(Zanieczyszczenie powietraz atmosferycznego a stan zdrowia ludnosci). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(5):59-65, 1970. 31 refs.*

NTIS: TT 70-P55124/5

The history of world research and international concern with the effects of air pollution on human health is briefly outlined. The role of the epidemiologist in health studies and the inherent difficulties of health effects research are discussed.

29682 **APTIC NO. 51090**

Sessa, T., L. Pecora, G. Vecchione, and R. Mole

CARDIO-RESPIRATORY FUNCTION IN BRONCHOPNEUMOPATHIES CAUSED BY IRRITANT GASES. *(La fonction cardio-respiratoire dans les suites des bronchopneumopathies par gaz irritants). Poumon Coeur (Paris), 26(9):1097-1107, 1970. 25 refs. Translated from French, 14p.*

The cardio-respiratory functions of workers suffering from acute poisoning by chlorine and sulfur dioxide vapors were examined. Clinical signs in the workers exposed to chlorine were confined mainly to superior airways. In the sulfur miners, however, the symptoms included injury of the medium bronchi. Permanent functional characteristics included ventilatory insufficiency and reduction of maximal tolerated load in increasing load tests; these were more frequent in the sulfur miners than in the workers exposed to chlorine. For both groups, the reduction correlated with age and duration of work. Functional respiratory capacity and cardiovascular efficiency also decreased in some cases.

1969

29683 **APTIC NO. 51093**

Capodaglio, E., G. Pezzagno, G. C. Bobbio, and F. Cazzoli

A STUDY OF THE RESPIRATORY FUNCTION IN WORKERS ENGAGED IN THE ELECTROLYTIC PRODUCTION OF CHLORINE AND SODA. *(Indagine sulla funzionalita respiratoria di lavoratori addetti a produzione elettrolitica de cloro e soda). Med. Lavoro (Milan), 60(3):192-201, 1969. 35 refs. Translated from Italian, 17p.*

Workers engaged in the electrolytic production of chlorine and soda, a source of mercury vapor and chlorine gas, were examined to determine the degree of health impairment, if any, in correlation with pollutant concentrations in the air of the plants. Vital capacity, forced respiratory volume, residual volume, helium gradient during washout, and lung carbon monoxide diffusion capacity were tested. Questionnaires were used to chart the incidence of chronic bronchitis and pulmonary emphysema symptoms. Neither significant changes in the respiratory function nor a particular incidence of chronic lung diseases was established. The results of the CO diffusion capacity test differed significantly for the exposed and control workers, but the difference was attributed to the effects of cigarette smoking habits.

29684 **APTIC NO. 51091**

Sartorelli, Emilio

CLINICAL AND PATHOGENIC ASPECTS OF ACUTE BRONCHIAL PNEUMONIA FROM THE INHALATION OF GAS IRRITANTS. *(Aspetti clinici e patogenetici delle broncopneumopatie acute da inalazione di gas irritanti). Med. Lavoro (Milan), 60(10):561-565, Oct. 1969. 18 refs. Translated from Italian, 9p.*

The clinical and pathogenic aspects of acute bronchial pneumonia resulting from the inhalation of irritant gases, including chlorine, sulfur dioxide, ammonia, phosgene, nitrogen oxides, and ozone, are reviewed. From a clinical point of view, acute bronchial pneumonia from the inhalation of irritant gases comprises acute inflammatory processes of the conjuctiva, the primary airpaths, and the bronchia and the framework of acute pulmonary edema with pinpoint infections. Exposure to moderate concentrations also induces lacrimation, blepharspasms, burning sensations in the throat, respiratory oppression, cough, and hoarseness. In serious cases, acute bronchitis may result, with acute emphysema, massive pulmonary edema, and consequent death. The pathogenic characteristics include various degrees of vascular constriction, hypoxia, metabolic changes, and changes in membrane thicknesses. Treatments for alleviating the various symptoms and therapy are discussed

1968

29685 **APTIC NO. 51665**

Katano, Fumio

THE EFFECTS OF DUSTS IN THE PHARYNX, LARYNX, TRACHEA, AND LUNGS -- EXPERIMEN-

TAL STUDIES. (Funjin no into, koto, kikan oyobi hai ni taisuru eikyo -- sono jikkenteki kenkyu). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan Broncho-Esophagological Soc.), 19(6), 19(6):5-22, 1968. 23 refs.

Histopathological studies of the effects of dusts on the larynx, pharynx, trachea, and lungs were conducted on animals. Silica, red clay, and carbon were ground and put in a dust creater. Guinea pigs were exposed to the emission for 1 hr to 16 days. Dusts were supplied singly, or mixed with saline water and atomized in a nebulizer. Powders contained 30% of 10 micron sized particles, 20% of 20 micron particles, and other particles less than 100 micron. The average size of nebulized particles was 0.2 micron. With any kind of dust, strong histopathological effects appeared in the order of the pharynx, larynx, trachea, and lungs, when the dusts were not mixed with water. The most vulnerable parts were the pharynx back wall, larynx back ceiling, the vocal cavity, and the lower right lung; but there was no pattern for the trachea. When saline water was mixed with dusts, the symptom in the pharynx was either similar or less severe than the inhalation of dusts singly. In the trachea, the mixture of atomized water increased the damage and secretion. The mixture of water intensified the damage in the lungs in their entirety, not only in the lower right lung. The effects of red clay were more serious than silica. The effects of carbon particles were much less serious than the other two kinds of dusts. For long-period inhalation tests, effects were more severe with the addition of atomized water; the most serious damages appeared in the lungs, then trachea, larynx, and pharynx, in that order.

1967

29686 **APTIC NO. 51114**

Rupp, H. and D. Henschler

EFFECTS OF LOW CHLORINE AND BROMINE CONCENTRATIONS ON MAN. *(Wirkungen geringer Chlor- und Bromkonzentrationen auf den Menschen). Intern. Arch. Gewerbepathol. Gewerbehyg. (Heidelberg), vol. 23:79-90, 1967. 13 refs. Translated from German, 16p.*

The effects of low concentrations of chlorine and bromine on man were investigated with respect to the odor threshold and symptoms. Chlorine at 1.0 ppm was clearly perceived by all the subjects. The irritant symptoms, obvious at 0.1 ppm, included irritation of the nose and throat, cough, headache, and burning of the eyes. All the subjects smelled bromine at 0.01 ppm, and the subjective irritant symptoms occurring at 0.02-0.05 ppm were clearly more severe than with chlorine. The threshold limiting values, therefore, were proposed at 0.5 ppm for chlorine and 0.1 ppm for bromine.

1966

29687 **APTIC NO. 51080**

Higashida, Toshio, Migiwa Hosokawa, and Junichi Ito

STUDIES OF THE NEUROTOXIC ACTION OF PHTHALODINITRILE (PART I). *Sangyo Igaku (Jap. J. Ind. Health), 8(3), March 1966. (Presented at the Japanese Society of Industrial Medicine, Annual Meeting, 39th.) Translated from Japanese, 1p. (Complete text not available.)*

The neurotoxic effect of phthalodinitrile on rabbits was examined. The substance was administrered intraperitoneally in doses of 10, 25, and 50 mg/kg, and the effects were measured by electroencephalograms and electromyocardiograms. In most cases, arousal and seizure-like spike patterns were determined in the neocortical and hippocampal waves. Characteristic spontaneous muscular electrical discharges were also observed after electrical stimulation.

29688 **APTIC NO. 51084**

Kitamura, Shoji, Toshiyuki Tsukamoto, Komei Sumino, Kiyoshi Hayakawa, Takako Shibata, Aritomo Suzuki, Kiyoshi Miyazaki, Toshiyuki Funabiki, and Yoshitaka Nishizume

EXPERIMENTAL STUDIES OF PHTHALONITRILE. *Sangyo Igaku (Jap. J. Ind. Health), 8(3), March 1966 (Presented at the Japanese Society of Industrial Medicine, Annual Meeting, 39th.) Translated from Japanese, 3p. (Complete text not available.)*

The effects of phthalonitrile on mice were studied with respect to lethal dosage (LD-50), metabolism, and absorption and excretion mechanisms. The LD-50 was 62 mg/kg. Doses of 0.01, 0.1, 1, and 10 mg/kg had no effect on food uptake, weight increases, blood cells, or liver function. Pathological signs of effects on the organs were observed only for the 10 mg/kg 1-month group and the 1 and 10 mg/kg 3-month groups. The quantity in the blood serum and the liver was relatively high; in the urine, the greater part was excreted as phthalic acid.

29689 **APTIC NO. 51106**

Kubota, S.

NEW MAPS OF INDUSTRIAL DISEASES (NO. 5). PHTHALODINITRILE POISONING. *(Shokugyobyo shinchizu (Sono 5). Futarojinitoriru chudoku). (Source not indicated), p. 27-29, 1966 (?). 1 ref. Translated from Japanese, 8p.*

The toxic effects of phthalodinitrile (PDN) on workers in PDN manufacturing plants were examined. Sixteen cases of PDN poisoning were studied, and data were collected on time of attack, symptoms, and correlation with animal experiments. The major symptoms included nausea, headaches, anorexia, loss of memory, systemic fatigue, numbness, and subsequent convulsions. Chronic poisoning through skin applications resulted in anemia and liver damage.

29690 **APTIC NO. 51083**

Miyama, Tomoshiro and Haruo Katsumuma

EXPERIMENTAL STUDIES ON THE ACUTE TOXICITY OF PHTHALODINITRILE. 1. LD50 AND ED50 OF PHTHALODINITRILE PER OS IN MICE. 2. CHANGES IN THE EEG OF RABBITS. *Sangyo Igaku (Jap. J. Ind. Health), 8(3), March 1966. (Presented at the Japanese Society of Industrial Medicine, Annual Meeting, 39th.) Translated from Japanese, 3p. (Complete text not available.)*

The effect of phthalodinitrile (PDN) in acute poisoning cases was studied. The lethal dose LD-50 and effective dose (ED-50) were determined, using convulsions as the indicator. Changes in brain waves in the form of epileptoid seizures and the effects on the nervous system were also examined. Administered orally to rats, the LD-50 was 171 mg/kg and the ED-50 was 126 mg/kg. Dosages over the lethal dose reduced initial movement and resulted in clonus within 10 min, followed by tetanus and death

29691 **APTIC NO. 51081**

Yoshikawa, Hiro

STUDIES OF PHTHALODINITRILE AND TETRACHLOROPHTHALODINITRILE POISONING. 2. THE RELATIONSHIP BETWEEN O-PHTHALODINITRILE AND VARIOUS PHARMACEUTICALS. *Sangyo Igaku (Jap. J. Ind. Health), 8(3), March 1966. (Presented at the Japanese Society of Industrial Medicine, Annual Meeting, 39th.) Translated from Japanese, 3p. (Complete text not available.)*

The metabolic action of o-phthalodinitrile (o-PDN) was studied. The chemical causes epileptoid seizures in persons exposed to it, but the mechanics of its toxicity are unclear. In mice injected with o-PDN, acetylcholine and acetazolamide reduced the death rates. The concurrent administration of acetylcholine suppressed the characteristic convulsions of o-PDN poisoning. When acetazolamide was administered concurrently, the systemic convulsions were only made less severe.

29692 **APTIC NO. 51082**

Yoshikawa, Hiro and Kiyono Kawai

STUDIES OF PHTHALODINITRILE AND TETRACHLOROPHTHALODINITRILE POISONING. 1. TOXICITY. *Sangyo Igaku (Jap. J. Ind. Health), 8(3), March 1966. (Presented at the Japanese Society of Industrial Medicine, Annual Meeting, 39th.) Translated from Japanese, 3p. (Complete text not available.)*

The lethal dose (LD-50) of the isomers of phthalodinitrile (PDN) and tetrachlorophthalodinitrile (TCPD) was examined. In mice injected intraperitoneally with o-, m-, and p-PDN, the LD-50 were, respectively, 34.5, 48.3, and 648.6 mg/kg. The characteristic symptoms included the mouse tail reaction with systemic convulsions for o-PDN poisoning, light systemic reactions for m-PDN, and quiet behavior with no convulsions for p-PDN. The LD-50 for o-, m-, and p-TCPN were, respectively, 66.4, 2.6, and 1581.3 mg/kg.

1960

29693 **APTIC NO. 51113**

Ueda, H.

HYGIENIC STUDY OF PHTHALODINITRILE INTOXICATION. *(Futarojinitoriru chudoku no eiseigakuteki kenkyu). Yokohama Igaku (Yokohama Med. J.), vol. 11:1425-1456, 1960. 16 refs. Translated from Japanese, 64p.*

The toxicity of phthalodinitrile was studied with respect to its physico-chemical properties and manufacturing, the epidemiology of occupational poisoning episodes, clinical symptoms, biological effects, and results of experiments with laboratory animals. The characteristic symptoms included clonic convulsions and brachycardia with some evidence of antidromic amnesia. The workers were examined for effects on body weight, blood parameters, blood cell counts, hemoglobin quantity, and liver function. In experiments with mice, the lethal dose (LD-50) value was 79.4 gamma/10 g of body weight in hypodermic injection.

EFFECTS-PLANTS AND LIVESTOCK

1973

29694 **APTIC NO. 51590**

Adedipe, N. O., R. A. Fletcher, and D. P. Ormrod

OZONE LESIONS IN RELATION TO SENESCENCE OF ATTACHED AND DETACHED LEAVES OF TOBACCO. *Atmos. Environ., 7(3):357-361, March 1973. 23 refs.*

Leaf discs, detached leaves, and attached leaves of 60-day old tobacco plants were fumigated with ozone at 30 pphm for 2 hours to determine whether O3-induced localized yellowing of leaves is physiologically related to normal leaf senescence and the magnitudes of visual and physiological manifestations of O3 injury. In a sensitive cultivar, O3 lesions were minimal on leaf discs, moderate on detached leaves, and severe on attached leaves. The O3 decreased the chlorophyll content by 26, 31, and 48%, respectively, in the leaves, but increased protein and RNA content only in detached leaves. Localized yellowing caused by O3 was not consistently accompanied by parallel and concomitant declines in chlorophyll, protein, and RNA which are characteristic of normal leaf senescence. (Author abstract modified)

29695 **APTIC NO. 51305**

Bell, J. N. B. and W. S. Clough

DEPRESSION OF YIELD IN RYEGRASS EXPOSED TO SULPHUR DIOXIDE. *Nature, (London), 241(5384):47-49, Jan. 5, 1973. 3 refs.*

The effects of prolonged periods of low sulfur dioxide concentrations on the growth of ryegrass were investigated to determine whether SO2 can cause visible injury and to measure the depression of yields at different concentrations. At a mean SO2 concentration of 0.120 ppm for 9 wk, the yield decreased 13% in the leaf number, 22% in tiller number, and 8% in length of the third leaf. Overall yield reduction was about 46%. The plants were much smaller than those in the control chamber and were rather chlorotic.

29696 **APTIC NO. 51230**

Brandt, C. Jeffrey and Richard W. Rhoades

EFFECTS OF LIMESTONE DUST ACCUMULATION ON LATERAL GROWTH OF FOREST TREES. *Environ. Pollut., 4(3):207-213, April 1973. 14 refs.*

The annual ring measurements of four species of trees in two areas were studied to determine the effects of limestone dust on lateral growth of forest trees. The control site had essentially no dust accumulation, while the test site had heavy dust accumulation from nearby limestone processing plants. The lateral growth of Acer rubrum, Quercus prinus, and Q. rubra decreased by at least 18% with dust accumulation; the lateral growth of Liriodendron tulipifera, however, increased by 76%. (Author abstract modified)

29697 **APTIC NO. 51576**

Buchauer, Marilyn J.

CONTAMINATION OF SOIL AND VEGETATION NEAR A ZINC SMELTER BY ZINC, CADMIUM, COPPER, AND LEAD. *Environ. Sci. Technol., 7(2):131-135, Feb. 1973. 17 refs. (Presented at the American Institute of Biological Societies, Annual Meeting, 22nd, Fort Collins, Colo., Aug. 1971.)*

The degree of soil and vegetation contamination of zinc, cadmium, copper, and lead emissions near a zinc smelter was investigated. Within 1 km of the smelters, 135,000 ppm Zn, 1750 ppm Cd, 2000 ppm Cu, and 2000 ppm Pb were measured in the air. Approximately 90% of the metals deposited on the soil surface were retained in the top 15 cm of the soil profile. Depauperate trees within 2 km of the smelters contained up to 4500 ppm Zn and 700 ppm Cd by weight in washed, oven-dried foliage. (Author abstract modified)

29698 **APTIC NO. 51484**

Carlson, Clinton E.

FLUORIDE IN VEGETATION NEAR A PHOSPHOROUS MANUFACTURING PLANT IN THE VICINITY OF BUTTE, MONTANA. *Insect Dis. Rep., no. 70-3:1-5, Feb. 1973. 2 refs.*

The fluoride content of vegetation at seven sites near a Butte, Montana, phosphate facility was determined with a specific ion probe. Amounts ranged from 9.4 ppm in Douglas fir foliage to 74.2 ppm in crested wheatgrass foliage. All but two analyses showed more than 10 ppm fluoride, the control level established at Columbia Falls. The State standard of 35 ppm for fluoride in plants was exceeded at three sites within one mile of the facility. No visible symptoms of fluoride injury were observed on coniferous foliage.

29699 **APTIC NO. 51170**

Craker, L. E. and J. S. Starbuck

LEAF AGE AND AIR POLLUTANT SUSCEPTIBILITY: UPTAKE OF OZONE AND SULFUR DIOXIDE. *Environ. Res., 6(1):91-94, March 1973. 8 refs.*

Leaf age and air pollutant susceptibility were correlated with respect to leaf uptake of ozone and sulfur dioxide. The uptake of O3 and SO2 was high in the intermediate age and low in the young and old leaves of tobacco plants. The differences in uptake agreed with the visible injury patterns, where the mature and young leaves were not injured by air pollutants but the leaves approaching maturity were necrotic and spotted. (Author abstract modified)

29700 **APTIC NO. 51491**

Evans, Lance S.

BEAN LEAF GROWTH RESPONSE TO MODERATE OZONE LEVELS. *Environ. Pollut., 4(1):17-26, Jan. 1973. 9 refs.*

The middle leaflet from the first trifoliate leaf of pinto bean plants was subjected to various ozone levels for 12 and 24 hr to determine oxidant injury. Rates of leaf expansion were used as criteria to measure the effects of ozone at three leaflet positions. Growth analysis included Y-intercepts indicating growth after day 1, growth after day 3, and regression line slopes between days 1 and 7 after the beginning of exposure experiments. Slopes of growth rate regression lines differentiated untreated leaflets from leaflets exposed to an 0.60 ppm/hr dose (0.05 ppm for 12 hr). Growth rates of plants exposed to 1.20 ppm/hr (0.05 ppm for 24 hr or 0.10 ppm for 12 hr) were distinguishable from untreated plants within three days. Basal leaf portions indicated the most differential ozone response compared with lateral and tip positions. (Author abstract modified)

29701 **APTIC NO. 51271**

Garrec, J. P., R. Bligny, A. Bisch, and A. Fourcy

ACCURATE FLUORIDE DETERMINATIONS THROUGHOUT POLLUTED FIR NEEDLES. *Fluoride, 6(2):73-78, April 1973. 10 refs.*

Fluoride analyses were made of the surface tissues of polluted needles of fir trees by using microanalysis by proton nuclear reaction. Two distinct peaks of fluoride accumulation were established. The first in the extreme tip of the needle s necrotic area, and the second in the narrow strip which separates the healthy from the injured tissue. The magnitude of these two accumulations and the distribution of fluoride throughout the needle is related to the age of the needle. The amounts of fluoride differ depending upon which side of the needle is measured, the upper surface takes up more fluoride than the lower one. (Author abstract modified)

29702 **APTIC NO. 51306**

Iijima, Tsutomu, Shigeo Sugata, and Toshio Ohira

HISTOLOGICAL EXAMINATION OF PLANT DAMAGE BY PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu ni yoru higai shokubutsu no soshikigakuteki kento). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 4:105-107, March 31, 1973. 3 refs.*

Plant damage suspected of being caused by photochemical smog was examined by an optical microscope. Twenty-one specimens of damaged plants were compared with 19 specimens exposed to ozone, and the damaged tissues were examined. Among the 15 annuals, brown spots similar in both appearance and structural transformation were reproduced on the ozone-exposed plants. Yellow or white spots on plants had characteristics that were similar to ozone damage. The damage to taro potatoes, petunias, and cauliflowers was quite different from the ozone damage. On perennials, similar damage was reproduced by the ozone exposure. The damage on 15 specimens was judged to be ozone damage. With few exceptions, all the special damage was in the palisade tissues of the leaves. The cell damage could be classified into the deformation of cell walls and discoloration of cells. The former manifested itself as white spots and the latter as mottling and necrosis.

29703 **APTIC NO. 51573**

Klein, David H. and Philip Russell

HEAVY METALS: FALLOUT AROUND A POWER PLANT. *Environ. Sci. Technol., 7(4):357-358, April 1973. 3 refs.*

The degree of fallout of heavy metals around a coal-fired power plant was measured with respect to soil and plant material enrichment. Samples of soil, grasses, leaves, and biota were analyzed for contents of iron, titanium, zinc, cobalt, chromium, copper, nickel, cadmium, silver, and mercury, and the data were correlated with wind patterns. The soils were enriched with Cd, Co, Cr, Cu, Fe, Hg, Ni, Ti, and Zn and the plant materials were enriched in Cd, Fe, Ni, and Zn. Soil enrichments correlated with wind patterns and with the metal content of the coal except for Hg, which was only slightly enriched. (Author abstract modified)

29704 **APTIC NO. 51206**

Knight, H. D. and R. G. Burau

CHRONIC LEAD POISONING IN HORSES. *J. Amer. Vet. Med. Assoc., 162(9):781-786, May 1, 1973. 28 refs.*

Cases of chronic lead poisoning in horses were examined to determine the degree and source of contamination. The chronic toxicity was characterized by anorexia, loss of body weight, muscular weakness, anemia, laryngeal hemiplegia, and terminal inhalation pneumonia. The lead content in the liver specimens of the poisoned horses was greater than that indicative of lead poisoning, the lead content of blood, however, was equivocal. The concentration of lead in vegetation samples was 325 ppm, a normal horse, therefore, would consume about 2.9 g of lead daily, i.e., a toxic amount. Airborne fallout from a nearby lead smelter was proposed as the primary mode of pasture contamination. (Author summary modified)

29705 **APTIC NO. 51298**

LeBlanc, Fabius, Dhruva N. Rao

EVALUATION OF THE POLLUTION AND DROUGHT HYPOTHESES IN RELATION TO LICHENS AND BRYOPHYTES IN URBAN ENVIRONMENTS. *Bryologist, 76(1):1-19, Spring 1973. 116 refs.*

The evidences on the pollution and drought hypotheses which seek to explain the rarity of lichens and bryophytes in urban environments are critically examined. The premise and logic of the drought hypothesis are not acceptable. The importance of experimentation and of phytosociological quantification in ecological hypotheses are stressed. (Author abstract)

29706 **APTIC NO. 51204**

Marletta, G. Pertoldi, L. Favretto Gabrielli, and L. Favretto

LEAD IN GRAPES EXPOSED TO AUTOMOBILE EXHAUST GASES. *J. Sci. Food Agr., 24(2):249-252, Feb. 1973. 11 refs.*

Lead accumulation in grapes from vineyards exposed to lead contamination due to their proximity to roads carrying heavy traffic was investigated. Lead accumulation in the grapes exposed to exhaust gases decreased parabolically with the logarithm of the distance from the source of pollution. The maximum extrapolated value was 4-6 micrograms/g of dried grapes, i.e., 10 times the normal content. The pollution index decreased to zero at 100-200 m away from the road. (Author abstract modified)

29707 **APTIC NO. 51288**

McGovern, P. C. and D. Balsillie

HOW SULPHUR DIOXIDE AFFECTS VEGETATION IN THE SUDBURY AREA. *Water Pollution Control (Toronto), 111(3):70, 73-74, 76-79, April 1973.*

The incidence and degree of vegetation damage caused by sulfur dioxide in the Sudbury industrial area were investigated. Sulfur dioxide concentrations were measured on a daily, monthly, and yearly basis, and data were correlated with wind speed and direction, distance from smelters, and vegetation injury. The daily SO2 values ranged within 0.01-1.97 ppm, with 11.2% of the readings above 0.25 ppm. To correlate the effects of various SO2 concentrations with duration of fumigation, intensity factors were computed. Most vegetation injury occurred at 0.95 ppm SO2 for a 1-hour duration, 0.55 ppm for 2-hour, 0.35 ppm for 4-hour, and 0.25 ppm for 8-hour.

29708 **APTIC NO. 51455**

Stefanson, R. C.

EVOLUTION PATTERNS OF NITROUS OXIDE AND NITROGEN IN SEALED SOIL-PLANT SYSTEMS. *Soil Biol. Biochem., 5(1):167-169, Jan. 1973. 5 refs.*

Evolution patterns of nitrous oxide and nitrogen in sealed soil-plant systems are discussed. Sealed growth chambers were used to measure the effects of soil organic matter content, soil water content, and the form of applied nitrogen and plant growth on the evolution of nitrous oxide and nitrogen. Samples of red-brown earth were collected from two sites in the air-dry condition and passed through a 0.6 cm rotary sieve. These soils were packed in plastic pots to a density of 1.45 g/cu m, and an amount of nitrogen was added with sufficient water to bring the soil to the required water content. The internal atmosphere of the chamber was sampled daily for the first 10 days and then three times/week. Pre and post-experimental analyses showed that the only major products of denitrification in the chambers were N2O and N2. Soil organic matter content, soil water content and plant growth did not greatly affect the relative gas composition.

29709 **APTIC NO. 51236**

Switoniak, Teresa, Jadwiga Salmowa, and Henryk Rafalski

BIOLOGICAL QUALITY OF PROTEINS OF CORN FROM TWO AREAS OF DIFFERENT EXPOSURE TO POLLUTION BY INDUSTRIAL PLANTS. *(Biologiczna jakosc bialek zbox pochodzacych z dwuch stref roznego oddzialywania obiektow przemyslowych). Text in Polish. Rocz. Pzh., 24(1):73-79, 1973. 12 refs.*

The digestibility and maximum biological quality of proteins of grain growing in areas exposed to air pollution from two different industrial plants was studied. The grains studied included maize, wheat, and rye from areas near a nitrogen fertilizer plant and from areas around an exhausted sulfur mine. The value of the grain was assessed on rats. The total content of total nitrogen and protein-nitrogen was higher in the wheat and rye from the sulfur mine area. No differences in the digestibility and maximum biological quality of proteins from these areas were observed. Rye protein had the highest biological quality and growth efficiency independently of the area where it had grown. The consumption of these crops had no effect on the chemical composition of rat bodies and survival during 40 days of observation.

29710 **APTIC NO. 51425**

Turner, Neil C., Saul Rich, and Paul E. Waggoner

REMOVAL OF OZONE BY SOIL. *J. Environ. Quality, 2(2):259-264, April-June 1973. 18 refs.*

Several measurements of the vertical profiles of horizontal wind, temperature, and ozone concentration above a bare, freshly cultivated fine sandy loam were obtained on 12 occasions during a 4-day period in July when ozone concentrations ranged from 8 to 26 times 10 to the 11th power mol/cu cm. The decrease in ozone near the soil surface clearly indicated that the soil was removing ozone from the atmosphere. The rate of ozone removal varied from 3 to 12 times 10 to the 11th power mol/sq cm sec. The flux into the soil varied with the concentration of ozone in the air and indicated a resistance of about 2 sec/cm to ozone removal by the soil and the 2.5 centimeter air layer immediately above the soil. The rapid removal of ozone by soil in a ventilated chamber suggested a small resistance in the soil alone. A sample of soil containing 14% moisture had a resistance of 0.37 sec/cm to ozone removal, which was 0.23 sec/cm greater than that of activated charcoal, a strong adsorbing agent. Compaction and additional soil moisture increased the resistance to ozone removal, whereas autoclaving decreased the resistance.

1972

29711 **APTIC NO. 51065**

Ministry of Health and Welfare (Japan), Bureau of Environmental Sanitation

OPINION OF THE WELFARE MINISTRY WITH REGARD TO ENVIRONMENTAL POLLUTION BY CADMIUM AND COUNTERMEASURES TO BE TAKEN. *(Kadomyumu ni yoru kankyo osen ni kansuru koseisho no kenkai to kongo no taisaku). [illegible] Kadomyumu Kankyo Osen Taisaku (Countermeasur[illegible]inst Environmental Pollution by Cadmium), p. 14[illegible]arch 1972. Translated from Japanese by Seiza[illegible], Japanese Language Translation Service, Fujisa[illegible]*

Environmental pollution by cadmiu[illegible]udied. Outlines of investigations are presented, includi[illegible]dy of environmental pollution by trace amounts of h[illegible]tals, such as cadmium; determining temporary stand[illegible]d guidelines for cadmium in food; and determinin[illegible]orary standards and guidelines for cadmium in drink[illegible]er. These studies were undertaken to get a general o[illegible] of the problem and to eventually use the acquired da[illegible]etermine temporary countermeasures and regulations [illegible]mium. Suggested countermeasures include: contin[illegible]ch and monitoring; epidemiological investigatio[illegible]aminations to establish the presence or absence o[illegible]n the inhabitants, and perfecting diagnostic tech[illegible]engthening local health services; and instituting e[illegible]andards for industrial cadmium sources, especially [illegible] works, refineries, and mining operations.

29712 **APTIC NO. 51078**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Dept.

OPINION OF THE WELFARE MINISTRY WITH REGARD TO ENVIRONMENTAL POLLUTION BY CADMIUM IN THE BASIN OF THE YOSHINO RIVER IN YAMAGATA PREFECTURE AND COUNTERMEASURES TO BE TAKEN. *(Yamagata-ken yoshinogawa ryuiki ni okeru kadomyumu kankyo osen ni kansuru koseisho no kenkai to kongo no taisaku). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium). p. 219-231, March 1972. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 15p.*

Environmental pollution by cadmium in the basin of the Yoshino River in Yamagata Prefecture of Japan was studied. Samples were taken from water, subsoil, soil, crops, and meals (grains) in the river and its basin, and analyzed for cadmium, zinc, and lead concentrations. Evaluation of the concentrations showed that the river water, discharge water from mines and smelting plants, subsoil, and soil showed high concentrations of these metals. Drinking water, polished rice, unpolished rice, and meals, and the intake per day per adult person of cadmium, showed concentrations below the set standards. Periodic monitoring of Cd concentrations should continue, discharge water from the smelting plants should be overseen, and the area s water supply should be changed from the Yoshino River to the Mogami River.

29713 **APTIC NO. 51055**

Bidwell, R. G. S. and D. E. Fraser

CARBON MONOXIDE UPTAKE AND METABOLISM BY LEAVES. *Can. J. Botany, 50(7):1435-1439, 1972. 15 refs.*

The mechanisms of carbon monoxide uptake and metabolism by bean leaves were studied. In light, CO was converted mainly to sucrose and proteins. The distribution of carbon-14 among the products suggested that most of the absorbed CO was reduced and incorporated into serine which was converted to sucrose. Some CO was oxidized to carbon dioxide, part of which may have been refixed as such in photosynthesis. In darkness, CO was absorbed nearly as fast as in light but was almost completely converted to CO2 and released. Light CO fixation rates varied between 0-0.25 micromole/sq dm/hr, were roughly proportional to CO concentration, and were unrelated to photosynthesis rates. The CO reduced or abolished CO2 fixation rates in some leaves. The CO fixation by vegetation of intermediate CO-fixing capacity was calculated to be 12-120 kg/sq km ground/day. (Author abstract modified)

29714 **APTIC NO. 51526**

Bohn, Hinrich L.

SOIL ABSORPTION OF AIR POLLUTANTS. *J. Environ. Quality, 1(4):372-377, Oct.-Dec. 1972. 79 refs.*

The mechanism and rates of the absorption of various air pollutants by soil are reviewed with respect to particulate air pollutants, including nickel, cadmium, lead, arsenic, copper, beryllium, zinc, and mercury; and gaseous air pollutants, including sulfur dioxide, carbon monoxide, nitrogen oxides, oxidants (chlorine, ozone, and peroxyacetyl nitrate), hydrogen sulfide, mercaptans, aldehydes, hydrocarbons, fluorine compounds, phosphorus compounds, and acidic gases and mists (hydrogen chloride, sulfuric acid, phosphoric acid, nitric acid, and hydrogen fluoride). Soils absorb organic gases faster and in greater amounts with increasing molecular weight and increasing number of nitrogen, phosphate, oxygen, and sulfur groups in the compound. The absorption of lower molecular weight and less-substituted organic gases depends on the buildup of an appropriate microbial population. The absorption of inorganic air pollutants is primarily by chemical and physical means and involves oxidation and other chemical reactions. (Author abstract modified)

29715 **APTIC NO. 51449**

Hanson, George P.

RELATIVE AIR POLLUTION SENSITIVITY OF SOME LOS ANGELES ARBORETUM PLANTS. *Lasca Leaves, 22(4):86-89, Dec. 1972.*

Factors are identified which may lend tolerance in plants from the few studies which have investigated the mechanism of air pollution tolerance in plants. These include small stomate size, low stomatal frequency, ability to close stomacats upon contact with air pollutants, high concentrations of carbohydrates, free amino acids, ascorbic acid in leaf tissue, increased fatty acids in cell membranes, defective root system, and slow growth rate. Many of the proposed air pollution tolerance mechanisms would be detrimental to a plant competing with other plants in a pollution-free environment, and the plant would probably lose out in the single survival. The ponderosa pines which have evolved as the dominant vegetation in many forested areas are suddenly finding themselves at a severe disadvantage by their inability to cope with a drastically altered air composition. The cedars and giant sequoias previously handicapped because of the genetic restraints upon their growth and development now find themselves better able to compete in the polluted air.

29716 **APTIC NO. 51044**

Hillimann, Ruediger Carl

BIOLOGICAL EFFECTS OF AIR POLLUTION ON INSECTS, EMPHASIZING THE REACTIONS OF THE HONEY BEE (APIS MELLIFERA L.) TO SULFUR DIOXIDE. *Pennsylvania State Univ., University Park, Dept. of Entomology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., March 1972, 170p. 114 refs.*

Ecological responses of insects to environmental air pollution by sulfur dioxide were investigated. Chronic SO2 toxicity tests on the honey bee, Apis mellifera L., were conducted under controlled conditions to determine the influence of SO2 upon brood rearing, pollen collection, worker bee mortality, flight activity, honey production, and intrahive behavior. Investigations to determine intrahive SO2 contamination of honey, pollen, larvae, and adults were also performed. Honey bee eggs, larvae, pupae, and adults were also exposed to acute 1000 ppm SO2 fumigations to determine the relative sensitivity to SO2 among life stages. Behavioral responses of adult honey bees were monitored during the acute fumigations to determine the sensitive biological systems. The deleterious effects of SO2 noted in field studies were confirmed during controlled chronic honey bee fumigations with SO2. Significant reductions in brood rearing among fumigated colonies led to correlated declines in pollen collection. Both brood rearing and pollen collection exhibited inverse linear relationships with increasing SO2 concentrations. Control colonies exhibited significantly more flight activity than fumigated colonies, and the reduced number of flights by fumigated colonies contributed to concurrent reductions of stored honey and colony weights. Sulfur dioxide s effect upon bee mortality was unclear. No significant differences in sulfur percentages were detected between fumigated and nonfumigated samples of adult or larval honey bees, honey or pollen. The acute SO2 exposures revealed that of the four honey bee life stages, adults were the most sensitive to SO2, followed in order by larvae, eggs, and pupae. Behavioral aberrations during acute SO2 exposures progressed as follows: hyperactivity, scent gland exposure, equilibrium loss, mouthpart and appendage cleaning, crescent body shape, vigorous abdominal pulsation, salivation, excessive moisture accumulation on the exoskeleton, torpidity, and death.

29717 **APTIC NO. 51222**

Horita, Yasuo

AN INTRODUCTION TO POLLUTION AND BIOLOGY. (NO. 2). *(Kogai seibutsugaku nyumon). Text in Japanese. Kagaku to Yakugaku no Kyoshitsu (Chem. Pharm., Quart. J.), no. 35:21-30, 1972. 6 refs.*

The mechanism of photosynthesis, environmental conditions, and the chemical and biological significance of photosynthetic bacteria are discussed. Photosynthetic bacteria, which are extremely useful and important in the ecological system, can become a cause of pollution when excessively proliferated. The idea that pollution could be solved by planting vegetation is also a misconcept. Carbon dioxide is not the major source of pollution, and local increases of CO2 partial pressure do not affect the environment in general. More important, green plants are sensitive to air pollutants and react faster than any other living things to pollutants such as ethyl, fluorides, nitrate, ozone, peroxyacetyl nitrate, and sulfur dioxide. Only 1-3% of solar energy is used for photosynthesis. The use must be increased to maximum by effective planning of plant formation, density, and arrangements. Through genetic studies, production and proliferation of useful plants should be planned and developed. Pollution control must be programmed ecologically, most suitable ecological systems must be developed in various geographical areas, in addition to the effort to eliminate pollution sources.

29718 **APTIC NO. 51075**

Ivakhnenko, A. G., Ye. I. Spynu, I. Z. Patratiy, and L. N. Ivanova

THE MATHEMATICAL PREDICTION OF DEGRADATION TIME OF PESTICIDES IN PLANTS BY THE PROBABILITY ALGORITHMS OF THE GROUPED ARGUMENTS METHOD. *(Matematichkoye prognozirovaniye prodolzhitel nosti degradatsii pestitsidov v rasteniyakh po veroyatnostnym algoritmam metoda grouppovogo ucheta argumentov). Gigiena i Sanit., vol. 37:43-48, Oct. 1972. 4 refs. Translated from Russian, 8p.*

The degradation time of pesticides in plants was investigated. Factors which determine the time constant include: physico chemical properties of the preparation, conditions of its use, and the structural characteristics of the treated object. Criteria used to determine the degradation time of poisonous chemicals included: molecular weight, melting point, solubility in fats, solubility in water, stability at pH 5.0-8.0, volatility, stability in an alkaline medium, stability in an acid medium, pH of culture, amount of water in culture, total acidity, proteins in culture, fats, cellular tissue, ash, total amount of sugar, nitrous substances, pectin substances, number of treatments per culture, norm for consumption of preparation, average air temperature from the time of treatment until the end of the study, and rainfall total for the indicated time in a given region. Data characterizing degradation processes in plants of 15 pesticides belonging to various chemical classes under different conditions of their use were analyzed. The lifetime of poisonous chemicals varied within wide limits, the time constant ranging from 4.3 to 88 days. A formula and tables were compiled to ascertain the classification of pesticides and thereby predict their degradation time. The prediction formula was obtained through polyserial probability algorithms of the grouped arguments method. The mathematical model and the formulations are discussed. Comparison of calculated data, according to the discrimination formula, and actual data showed that the accuracy of prediction was on the order of 80%.

29719 **APTIC NO. 51107**

Jaeger, H. -J., E. Pahlich, and L. Steubing

THE EFFECT OF SULFUR DIOXIDE ON THE CONTENT OF AMINO ACIDS AND PROTEIN IN PEA SEEDLINGS. *(Die Wirkung von Schwefeldioxid auf den Aminosaeure- und Proteingehalt von Erbsenkeimlingen). Angew. Botan., vol. 46:199-211, 1972. 55 refs. Translated from German, 19p.*

The effects of sulfur dioxide on the protein and soluble amino acid content of pea seedlings were investigated in a controlled climate chamber. Characteristic alterations in the protein and amino acid concentrations were determined and were related to exposure time, SO2 concentration, and plant age. The mechanism of SO2 damage was examined.

29720 **APTIC NO. 51275**

Kawasaki, Tsugio

THE CIRCULATION OF NITROGEN IN THE ECOLOGICAL SYSTEM AND POLLUTION--ESPECIALLY THE BODY CIRCULATION. *(Seitaikei ni okeru chisso no junkan to kogai--tainai junka o chushin to shite). Text in Japanese. Kagaku to Yakugaku no Kyoshitsu (Chem. Pharm., Quart. J.), no. 37:27-31, 1972.*

In the study of nitrogen in the body circulation of plants, the effects of automotive emissions on plants were observed. The fluctuation of nitrogen content in the leaves of zelkova trees in a busy intersection of Tokyo and in front of a suburban station was measured. The two locations had approximately 3000 cars/hr and 2000 cars/hr traffic. The zelkova buds grow in the latter part of April to early part of May, at which time new leaves contain approximately 5% of nitrogen. The amount gradually decreases. This pattern was confirmed only in areas with little or no traffic. At the test locations, extraordinary dropping of leaves were noted in July, August, September, and October, and unseasonal budding occurred each time. However, the amount of nitrogen and the size of new leaves decreased at each new budding, indicating that the nitrogen stock in the tree had decreased. When the nitrogen stock in the tree is completely exhausted, the tree will die.

29721 **APTIC NO. 51584**

Mann, C. W.

PLANTS CONTAMINATED BY TIMBER TREATMENT. *Environ. Health, 80(10):360, Oct. 1972.*

The foliage of plants in gardens in the immediate vicinity of a timber treatment plant appeared to be dying off in the Chailey Rural District, Sussex, England. The sample consisting of the foliage of bean, potato, cabbage, and parsnip had been damaged to various degrees. Rusty brown spots on all the leaves were observed and the bean leaves were completely dead. Insects attached to the plants were dead or dying with the appearance of having been burned. The analysis of the bean plant showed 286 ppm of chromium, 378 ppm of copper, and 596 ppm of arsenic. These plants had been severely contaminated with Tanalith C, and any food contaminated with these amounts of chemicals would be very dangerous and possibly poisonous. Further samples of fruit including pears, blackberries, and strawberries showed similar contamination which varied according to the distance from the timber plant treatment. It appears that contamination has probably occurred primarily from the actual powder used for making the preserving solution being blown about immediately prior to mixing, from contaminated dust in the yard where the timber drips after impregnation also being blown about, and from some solution and/or spray from the exhauster drifting onto the adjoining land.

29722 **APTIC NO. 51600**

Nakamuro, Katsuhiko, Yasuyoshi Sayato, and Masaharu Tonomura

STUDIES ON THE ATOMIC ABSORPTION SPECTROSCOPIC DETERMINATION OF CADMIUM. *(Kadomium no genshi kyuko kodoho ni kansuru kenkyu). Text in Japanese. Eisei Shinkensho Hokoku (Bull. Natl. Inst. Hyg. Sci., Tokyo), no. 90:38-43, Nov. 1972. 4 refs.*

A convenient, quick, and accurate procedure for determination of cadmium contained in various kinds of materials was established. In this method, the material is combusted by the oxygen bomb combustion method instead of the wet ashing method, and the cadmium ion is determined by atomic absorption spectrophotometry after treatment with DDTC-MIBK (sodium diethyl dithiocarbamate- methyl isobuthyl ketone) system. This procedure showed linearity within the range of 0.2 to 5.0 micrograms when assayed at the wavelength of 2288A, and the sensitivity was 0.2 micrograms cadmium in 10 ml MIBK solution. The recovery rate of cadmium was about 100% on the average by this method. Cadmium was determined in rice and fish.

29723 **APTIC NO. 51608**

Ozog, Jennie A. and R. G. Cuddihy

NASAL ABSORPTION OF CSCL, SRCL2, BACL2, AND CECL3 IN SYRIAN HAMSTERS. *In: Annual Report of the Fission Product Inhalation Program. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., p. 69-73, Nov. 1972. 8 refs.*

NTIS: LF-45

The absorption of cesium chloride, strontium chloride, barium chloride, and cerium chloride from the nasopharynx directly into the general circulation was studied in Syrian hamsters and compared with gastrointestinal tract absorption. The experimental method is described and results are discussed. More than 50% of the cesium, strontium, and barium, but less than 4% of the cerium, was absorbed directly from the nasopharynx. For all isotopes, nasal absorption was about equal to or greater than gastrointestinal absorption during the first 4 hr after administration. The importance of direct nasal absorption of deposited materials in inhalation toxicity was evaluated, especially with readily soluble aerosols having mass median aerodynamic diameters greater than 5 micron when nasopharyngeal deposition predominated. (Author abstract modified)

29724 **APTIC NO. 51110**

Pahlich, E., H. -J. Jaeger, and L. Steubing

THE EFFECT OF SO2 ON THE ACTIVITIES OF GLUTAMATE DEHYDROGENASE AND GLUTAMINE SYNTHETASE FROM PEA SEEDLINGS. *(Beeinflussing der Aktivitaeten von Glutamatdehydrogenase und Glutaninsynthetase aus Erbsenkeimlingen durch SO2). Angew. Botan., vol. 46:183-197, 1972. 23 refs. Translated from German, 22p.*

The effect of sulfur dioxide on the metabolism of glutamate dehydrogenase and glutamine synthetase in pea seedlings was investigated. The glutamate dehydrogenase reacted in a typical fashion: the NADH reaction was activated with an accelerated synthesis of L-glutamic acid and the conversion rate of the NAD+ reaction decreased, reducing the decomposition of L-glutamic acid. The enzyme glutamine synthetase only slightly increased in activity.

29725 **APTIC NO. 51109**

Pellissier, Marc

ATMOSPHERIC POLLUTION AND ITS EFFECTS ON VEGETATION. *(La pollution atmospherique et ses effets sur la vegetation). Ministere de la Protection de la Nature et de l Environnement (Quebec) and Quebec Univ., Trois-Rivieres (Quebec), Joint Pub., 1972. 5 refs. Translated from French, 51p.*

The effect of air pollution on vegetation and the air quality in the Canadian industrial regions of Shawinigan, Grand-Mere, Trois-Rivieres, and Cap-de-la-Madeleine were investigated. The major emissions in the areas were traced to their sources, and the industrial processes and controls were examined. Pollutants of greatest interest due to their toxic effects on vegetation were sulfur dioxide, fluorine and chlorine compounds, particulates, and hydrogen fluoride. The general effects of the pollutants on vegetation were reviewed, and damages to vegetation characteristic of each region were studied with respect to plants affected, sensitivity ratings, and symptoms of damage. The Shawinigan area was the most affected by air pollution, followed by Cap-de-la-Madeleine, Trois-Rivieres, and Grand-Mere. The major symptoms, detected in various degrees on the leaves and needles of trees, included necrosis, defoliation, burns, chlorosis, and spotting.

29726 **APTIC NO. 51527**

Reinert, Richard A. and Harvey W. Spurr, Jr.

DIFFERENTIAL EFFECT ON FUNGICIDES ON OZONE INJURY AND BROWN SPOT DISEASE OF TOBACCO. *J. Environ. Quality, 1(4):450-452, Oct.-Dec. 1972. 9 refs.*

The differential effects of fungicidal applications on the incidence of ozone injury and brown spot disease on tobacco leaves were investigated. The protective qualities of maneb, dodine, and benomyl were studied. All of the fungicidal applications decreased ozone injury to tobacco leaves. Benomyl was most effective, decreasing leaf injury by 59%. Maneb significantly decreased brown spot injury by 66%, and benomyl and dodine decreased injury by lesser degrees. (Author abstract modified)

29727 **APTIC NO. 51187**

Shaulis, N. J., W. J. Kender, Charlotte Pratt, and W. A. Sinclair

EVIDENCE FOR INJURY BY OZONE IN NEW YORK VINEYARDS. *HortScience, 7(6):570-572, Dec. 1972. 14 refs.*

The effect of ozone on grapevines was studied, and the data were correlated with field observations of injuries in New York vineyards. Widespread stippling and premature senescence of leaves of grapevines were observed in grapes grown near the Great Lakes. Identical symptoms were determined on grapevines exposed to 30 or 60 pphm ozone for 6 hr. The stippling, therefore, was a manifestation of O3 injury. (Author abstract modified)

29728 **APTIC NO. 51681**

Stewart, W. D. P.

ALGAL METABOLISM AND WATER POLLUTION IN THE TAY REGION. XVI. *Proc. Royal Soc. Edinburgh, Sect. B, 71(2/4):209-224, 1971/1972. 42 refs.*

Algal species composition and metabolism in lochs draining into the river Tay were investigated to provide a baseline for future studies of water pollution caused by increased Scottish east coast industrial activity associated with the North Sea oil boom. The Tay is currently the least polluted of major British rivers; runoff from agricultural land and input from domestic sewage are the main sources of input of waste products or nutrients. Rich blooms of algae, particularly blue-green algae, were present in many lochs, indicating that the waters are already mesotrophic or eutrophic. Combined nitrogen levels were appreciable but not sufficiently high to prevent nitrogen fixation. Phosphorus levels were particularly high and in excess of the requirements for algae growth. In the Tay estuary, there was no extensive algae development and little evidence of excess accumulation of nitrogen and phosphorus. Input of nitrogen and phosphorus from agriculture and urbanization may actually be beneficial by stimulating increased primary production in the Tay. Bioassay tests showed the presence of toxins inhibitory to algal metabolism in inflow waters to the Tay. While the nature of the toxins was not elucidated, high mercury levels were measured in a region of the Tay estuary. Air pollution, estimated by inhibition of nitrogenase activity on incubating the lichen Lichina confinis in air samples, was appreciable in Dundee but negligible in surrounding areas.

29729 **APTIC NO. 51321**

Treshow, Michael

AIR POLLUTION AS AN ECOLOGICAL FACTOR. *Clean Air, 6(3):41-43, Aug. 1972. (Presented at the International Clean Air Conference, 1972.)*

The air environment is vital to the health and welfare of man and to the health of plants. Thousands of acres of forest watersheds in Europe and North America have been blighted by sulfur dioxide emissions from smelters and power plants. Fluorides, particularly from aluminum plants and the phosphate industry, have also been destructive to natural areas. The current threat to forests and crops alike is mainly from automobile exhausts. When acted on by ultraviolet light, the emissions react photochemically to form ozone and peroxyacetyl nitrate which are highly toxic to many plant species. In California, more than 150,000 acres of Ponderosa pine have been damaged by oxidants, while herbs that protect land from erosion and are vital to maintaining the nutrient balance of the soil may have been killed off. Desert ecosystems may also be sensitive to the pollutants emitted by hugh coal-burning power plants being built in the Southwest. If society is willing to take action and pay the price, the technology for reducing industrial emissions to harmless levels is available. The standards set and attainable are adequate to protect man and plants. However, two problems persist: control of emissions from transportation sources, and compelling the use of known control technology on a world-wide basis.

29730 **APTIC NO. 51190**

Tumasonis, C. F. and F. D. Baker

INFLUENCE OF CARBON MONOXIDE UPON SOME RESPIRATORY ENZYMES OF THE CHICK EMBRYO. *Bull. Environ. Contamination Toxicol., 8(2):113-119, Aug. 1972. 17 refs.*

The effects of carbon monoxide on the levels of two respiratory enzymes of the chick embryo heart following exposure to 425 ppm CO in the air are examined. The level of cytochrome oxidase decreases significantly in the exposed embryo. The biologic effects of exposure and interaction are reviewed. The level of lactic dehydrogenase does not differ for the exposed and control groups. Hypertrophy of the heart was determined in embryos exposed to CO for 144 and 168 hours. The methods of carboxyhemoglobin and enzymatic determinations are discussed. (Author summary modified)

1971

29731 **APTIC NO. 51094**

Schnaider, Zbigniew

SUSCEPTIBILITY OF CERTAIN TREE GENERA TO BEING DEVOURED BY INSECTS AND THEIR USEFULNESS FOR RECONSTRUCTION OF FOREST AREAS IN INDUSTRIAL REGIONS. *(Podatnosc na zery owadow poszczegolnych gatunkow drzew i ich przydatnosci do przebudowy drzewostanow w rejonach przemyslowych). Ministry of Forestry and Timber, Cracow (Poland), Commission for Economic Forestry and Recultivation Affairs in Industrial Regions, 4(25):105-121, 1971. 24 refs. Translated from Polish, 15p.*

The effects of industrial emissions on the resistance of certain tree species to insects and fungi were examined with respect to the eventual application of this data to the reconstruction of forest areas in industrial areas. Insect pests commonly associated with pines, spruce trees, larches, firs, hemlock, thuja, birches, alders, oaks, beeches, maples, sycamores, ash trees, lindens, elms, aspens, poplars, willows, and other common forest species were reviewed and the resistance of these species to industrial emissions was considered.

29732 **APTIC NO. 51095**

Sierpinski, Zbigniew

SECONDARY NOXIOUS INSECTS OF PINE IN STANDS GROWING IN AREAS WITH INDUSTRIAL AIR POLLUTION CONTAINING NITROGEN COMPOUNDS. *(Szkodniki wtorne sosny w drzewostanach znajdujacych sie w zasiegu dzialania emisji przemyslowych zawierajacych zwiazki azotowe). Sylwan, 115(10):11-18, Oct. 1971. 4 refs. Translated from Polish, 11p.*

The effects of emissions from a nitrogen plant on pine stands in the area with respect to secondary insect populations, their qualitative composition, changes in population dynamics, and the economic significance of the effects were examined. The experimental stands were within the range of the effects of aerosols of ammonium sulfate, gaseous ammonia, nitrogen oxides, dust, and sulfur dioxide. The short-term very high concentrations of the nitrogen compounds resulted in quick necrobiosis of the tree stands, so that around 130 hectares of stands were destroyed by industrial emissions in 1967-1971. Secondary noxious insects attacked about 35% of the dead and dying trees. The population density of these insects was greatest in the zone of low exposure to industrial pollution and was least in stands exposed by cutting and felling.

1970

29733 **APTIC NO. 51470**

Cormis, L. de

ATMOSPHERIC POLLUTION AND VEGETATION. *(Zanieczyszczenie atmosfery a roslinnosc). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(5):22-31, 1970. (Presented at the French- Polish Symposium on Air Pollution Control, Paris, France, Nov. 17-21, 1969.)*

NTIS: TT 70-P55124/5

The effects of sulfur dioxide and fluorine compounds on vegetation were studied in two regions characterized by different topographies and climatic conditions. The relative susceptibilities of various plant species to SO2 were investigated in a spacious valley, with little or no wind and a high frequency of fog, where the major emission source was coal and heavy oil combustion and natural gas refining. The effects of SO2 were characterized by interveinal necrosis, blotches, and defoliation. The effects of fluorine compounds, particularly hydrogen fluoride, were observed in narrow valleys with shifting wind patterns where aluminum smelters were the major source of pollution. The essential feature of fluorine action was the progressive development of the necrotic zone. Plant indicators were discussed.

1968

29734 **APTIC NO. 51096**

Langkramer, Otakar

EFFECT OF INDUSTRIAL EXHALATIONS ON THE MICROFLORA OF SPRUCE GROWTH SOIL IN THE KRUSNA MOUNTAINS. *(Vliv prumyslovych exhalaci na mikrofloru pud smrkovych porostu v Krusnych Horach). In: Imise a Lesni Cenoxy. (Emissions and Forest Coenosis). Prague, Czechoslovakia, Czechoslovak Academy of Sciences, 1968, p. 53-62. 6 refs. Translated from Czech., 10p.*

The effects of industrial emissions on the quantitative and qualitative composition of the soil microflora in spruce stands were studied. Four areas of spruce stands were examined: two were undamaged, one was moderately damaged, and one was heavily damaged by industrial emissions. The total number of aerobic, anaerobic, and sporulating bacteria, celulolytic microbes, and microscopic fungi were determined. The basal respiratory activity of the soil, ammoniation capacity, nitrification capacity, moisture, pH reaction, and the amount of organic carbon and total nitrogen in the soil were studied. The soils in the area most heavily affected had the lowest organic carbon and total nitrogen content, the lowest carbon dioxide production, the highest average number of aerobic, anaerobic, and sporulating bacteria, and the smallest number of celulolytic micro-organisms. Ammoniation was better in both damaged soils, and nitrification was weak in all the soil samples.

29735 **APTIC NO. 51108**

Sobotka, Alois

ROOTS OF PICEA EXCELSA L. UNDER THE INFLUENCE OF INDUSTRIAL EMISSIONS IN THE ERZ MOUNTAINS REGION. *(Koreny Picea Excelsa L. pod vlivem prumyslovych exhalatu v oblasti krusnych hor). In: Imise a Lesni Cenosy. (Immissions and Forest Coenoses). Prague, Czechoslovak Academy of Sciences, 1968, p. 45-52. 14 refs. Translated from Czech., 9p.*

Biotic changes in soil components with respect to the effects of industrial emissions on the roots of spruce trees were studied. The seedlings in the damaged area of the stands were relatively weaker, and short roots from the damaged and undamaged areas differed slightly. The effect of air pollution on the short roots of the seedlings protected by the crown of mature stands was negligible. The short roots of maturing spruce trees, however, were considerably affected. The variability in the shapes of the roots in the damaged area increased, and number of deformed roots increased with approach to the soil surface.

1966

29736 **APTIC NO. 51648**

Engle, Ronald L.

REACTION OF ONION, ALLIUM CEPA L., AND PINTO BEAN, PHASEOLUS VULGARIS L., TO OZONE. *Wisconsin Univ., Madison, Dept. of Botany, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1966, 61p. 37 refs.*

The effects of ozone on onions and pinto beans were investigated. Tip burn, an ozone incited response in onion, inheritance and the mechanism for resistance to ozone damage in onion, and the effects of low levels of ozone on pinto beans were studied. Tip burn on onion leaves is related to flecking on the leaves. The flecking occurs prior to tip burn. The occurrence of significant concentrations of ozone in the microclimate of onion leaves during rainstorm activity damages cells of the leaves in localized areas giving rise to these flecks. When the damage is severe enough, blocks of cells including vascular bundles, are destroyed or altered so as to affect the orderly transport of materials, thereby causing a die-back of the leaf tip. No evidence was discovered suggesting tip burn to be a mineral nutrient abnormality or the result of a pathogen in commercial fields. Onion leaf discs subjected to controlled ozone fumigation in a microchamber were viewed under low power of a microscope. Correlations between genetic resistance and susceptibility to ozone damage and stomatal responses were obtained. Water loss by apparent transpiration was also used to measure the sensitivity of stomata to ozone. The resistance mechanisms are described. Fourteen day old pinto beans were also fumigated continuously from 1 to 5 days with 5 pphm ozone. The unifoliate leaves of plants sampled after 3 days of ozone fumigation exhibited premature senescence, and the effect was not increased by added ozone fumigation. Lateral buds in the axils of the unifoliate leaves were stimulated by the ozone treatments to elongate, whereas the unifoliate leaves were reduced in size and weight. All experimental methods are described, and results are listed and discussed.

EFFECTS-MATERIALS

1973

29737 **APTIC NO. 51123**

Beranek, E. and K. Barton

THE CONCEPT OF CORROSION AGGRESSIVITY OF THE ATMOSPHERE WITH RESPECT TO CARBON STEELS. *(Zum Bergiff Korrosionsaggresivitaet der Atmosphaere in Bezug auf Kohlenstoffstaehle). Text in German. Werkstoffe Korrosion, 24(5):372-378, 1973. 19 refs.*

The initial stages of atmospheric rusting were studied by exposing carbon steel samples with and without shelter in a polluted section of Prague. The average annual meteorological data at the point of exposure were temperature 10.8 C, relative humidity 72%, precipitation 488 mm, 2600 hr with a temperature of 0 C and a relative humidity of more than 80%, summarized sulfur dioxide adsorption on alkaline surfaces of 31.2 g/sq m/yr. The SO2 concentration of the atmosphere was measured with a modified Liesegang method. Two starting dates were selected for the exposure tests, July 1 and November 1, 1968. New sample groups were freshly exposed every month, and their corrosion evaluated at the end of the month. The measured monthly corrosions were then summed up. The initial stage of corrosion is controlled by the number of hours with a relative humidity of more than 80% at a temperature of above 0 C. The SO2 influences the corrosion kinetics only above a certain critical SO2 absorption concentration which was 0.66 g SO2/sq m/mo. Above this critical SO2 value the corrosion speed is linearly dependent on the SO2 absorption (concentration). The corrosion speed drops through formation of a rust layer. In the open atmosphere at low SO2 concentrations which are approaching the critical value, rust layers form which better protect against further corrosion than when the experiment was begun in winter during higher SO2 concentrations.

29738 **APTIC NO. 51253**

Legault, R. A., S. Mori, and H. P. Leckie

PREDICTING THE ATMOSPHERIC CORROSION BEHAVIOR OF STEEL IN AN INDUSTRIAL ENVIRONMENT. *Corrosion, 29(5):169-179, May 5, 1973. 49 refs.*

A method was devised which predicts the industrial atmospheric corrosion behavior of steel from laboratory measurements which can be obtained in a few days. A relationship was demonstrated between atmospheric exposure in an industrial environment and an accelerated laboratory exposure. A correspondence was shown between atmospheric corrosion rate as calculated from weight loss measurements and the time necessary to reduce a steel corrosion product oxide at a set current density. The combination of these two relationships allow the prediction of relatively long term atmospheric corrosion behavior from electrochemical measurements made on test specimens after a brief exposure in a controlled laboratory environment. Expressions were developed which relate electrochemical measurements obtained on test specimens after a 2-day laboratory exposure to atmospheric corrosion rates obtained in industrial environment exposures of 6 mo and 1 yr. This capability allows for a rapid evaluation of the effect of alloying additions on the atmospheric corrosion behavior of steel. The results support the contention that atmospheric corrosion kinetics on steel are controlled by the nature and growth of the corrosion product layer on a corroded steel surface.

29739 **APTIC NO. 51558**

Mikhaylovskiy, Yu. N., L. A. Shuvakhina, and Chin Tkhi Khong Van

METHOD AND CONDITIONS OF THE FAST CORROSION TEST OF ZINC AND CADMIUM IN EXPOSURE CHAMBERS. *(Metod i rezhimy uskorennykh ispytaniy tsinka i kadmiya na atmosfernuyu korroziyu v kamerakh iskusstvennogo klimata). Text in Russian. Zashch. Metal., 9(2):147-150, 1973. 7 refs.*

A fast method for the corrosion test of zinc and cadmium in corrosion chamber is described, and the results obtained by this method are compared with empirical data and long-term exposure tests. The corrosion of zinc and cadmium was investigated in an exposure chamber, applying a temperature range of 5-40 C, a humidity range of 80-98%, sulfur dioxide concentrations of 1 to 20 mg/cu m, and sodium chloride aerosol concentrations of 10 to 30 mg/sq m/day, with periodical application of phase layers of moisture from distilled water. Apart from particular divergences, the test data for the rates and corrosion and the rates of corrosion intensification due to sulfur dioxide, NaCl, and moisture were in good correlation with data from natural exposure tests. The fast corrosion test permitted the optimization of both the extent and duration of comprehensive corrosion tests, as well as prediction of expected corrosion effects under natural conditions on the basis of a limited number of empirical corrosion parameters and of known meteorological characteristics. A relative humidity of 95%, a temperature range of 5-40 C, and a chloride concentration of 5-50 mg/sq m/day are recommended for fast corrosion tests with respect to the commonest conditions under which zinc and cadmium are used.

29740 **APTIC NO. 51435**

Svoboda, M., B. Knapek, and H. Klicova

THE EFFECT OF PIGMENTS ON THE PENETRATION OF SULFUR DIOXIDE INTO COATINGS. *J. Oil Colour Chem. Assoc. (London), 56(4):172-174, 1973. 2 refs.*

The effect of pigments on the penetration of sulfur dioxide into surface coatings was investigated. Typical coatings based on alkyds, pigmented either with zinc oxide, representing a reactive pigment, or with titanium dioxide, representing nonreactive pigment were used in the experiments. These were extended to cover paints pigmented with metallic lead powder and based upon a pentaerythritol alkyd resin containing about 70% fatty acids of drying oils together with lead, and cobalt naphthenates as driers. The solids content was 68% and the paint was diluted for application with xylene in a ratio of 100 to 20. The paints containing zinc oxide and titanium dioxide were based on a 50% solution of the alkyd resin and were formulated to give pigment volume contents of 5, 10, 20, and 30. The presence of pigments caused a decrease in the rate of penetration of sulfur dioxide through a coating to the extent of 50-70%, according to the type of pigment present, in comparison with the rate of penetration through an unpigmented lacquer film.

EFFECTS-ECONOMIC

1973

29741 **APTIC NO. 51680**

Busch, J. S., W. E. MacMath, and M. S. Lin

PART I--THE BASIC SCRUBBER. *Pollut. Eng., 5(1):28-32, Jan. 1973.*

A step-by-step procedure is given for calculating the cost of a basic high-energy orifice scrubber based on the input requirements of inlet gas acfm, scrubber pressure drop, and materials of construction. The basic scrubber configuration consists of a convergent-divergent vertical venturi section, an elbow plus connecting horizontal crossover section, and a vertical separator section. The diverging section assists energy recovery; the separator allows scrubbing liquid to escape through a bottom port, while cleaned gas flows upward through a demister to remove entrained liquor and is exhausted by a fan draft. Combined scrubber and erection costs (1971) are calculated for carbon steel, 304 stainless steel, and 304 stainless steel 50,000-acfm scrubbers. The estimated costs are, respectively, $20,400, $37,700, and $47,800. The scrubber cost estimating procedures described predict costs within + or 2%.

29742 **APTIC NO. 51141**

Haack, Friedrich Wilhelm

ECONOMIC ASPECTS OF AIR CLEANING SYSTEMS IN SECONDARY ALUMINUM PLANTS. *(Wirtschaftliche Auswirkungen von Luftreinhaltungsanlagen auf Aluminium-Umschmelzbetriebe). Text in German. Erzmetall, 26(5):222-225, 1973. (Presented at the Hauptversammlung der Gesellschaft Deutscher Metallhuetten- und Bergleute, Stuttgart, West Germany, April 28, 1972.)*

The costs for a dust cleaning system in a secondary aluminum plant in Stuttgart are discussed. For meeting the demands by the Technical Directives on the Maintenance of Clean Air which require dust removal to a remaining concentration of 150 mg/cu m at the most, Luehr dust collectors were installed in 1967. Local conditions, flue gas composition, and flue gas quantities determine the size of the dust collection system. In most cases investments amounting to $100,000/furnace are necessary. These costs do not include the costs for buildings and stacks. Three-shift operation with double depreciation and a furnace capacity of 5000 tons/yr give capital costs of 35 cents/100 kg. Repair costs amount to 25 cents/100 kg. Further costs must be added for buildings, for the use of light fuel oil, for the fact that not every scrap can be used, and for higher administrative costs. Altogether 66 cents/100 kg must be added yielding a total amount of $1.50/100 kg. This amount is still not all exhaustive, because sometimes situations develop which require the unprogrammed cleaning of the filter by the personnel. Such costs cannot be expressed in numbers but it can be safely assumed that they will bring the total burden to nearly $1.15/100 kg.

29743 **APTIC NO. 51031**

Netschert, Bruce C.

ENERGY VS. ENVIRONMENT. *Harvard Bus. Rev., 51(1):24-26, 28, 133-134, 138, 140, Jan.-Feb., 1973. 4 refs.*

The production, conversion, and utilization of energy and the preservation of the environment are discussed. Energy growth, gasoline consumption, space heating and cooling, urban mass transportation, and electricity generation and transmission are reviewed. In relation to environmental preservation, the cost effect of preservation, the adequacy of fuel resources, the curtailment of energy growth, and efficiency gains are considered. With continued growth in energy demand, higher energy prices are inevitable.

1972

29744 **APTIC NO. 51355**

Fisher, Norman W. F.

AUTOMOTIVE AIR POLLUTION, AN ECONOMIST'S ANALYSIS. *SAE-Australasia, 32(5):176-188, Nov./Dec. 1972. 34 refs. (Presented at the Society of Automotive Engineers, 71st National Convention, Melbourne, Austral., Oct. 20, 1971. Paper 17.)*

The objective of this paper is to outline the contribution which economic analysis can make to the study of air pollution caused by motor vehicles and of possible methods of controlling this pollution. The production of air pollution by motor vehicles is described. The Australian information on automotive air pollution is outlined, and evidence that bears on the likely significance of this pollution in Australia is presented. Effects of air pollution on the health, plants, and property are discussed. Methods of emission control such as changes in vehicle operations, vehicle design, fuel used, transport system, and urban land use are described. An illustrative economic analysis of pollution control techniques is presented.

29745 **APTIC NO. 51604**

Vars, Charles R., Jr. and Gary W. Sorenson

STUDY OF THE ECONOMIC EFFECTS OF CHANGES IN AIR QUALITY. (FINAL REPORT). *Oregon State Univ., Corvallis, Air Resources Center, Air Pollution Control Office Contract CPA 70-117, EPA-R5-72-006, 288p., June 1972. 40 refs.*

NTIS: PB 219993

A modified version of the standard general equilibrium model was applied to evaluate the costs and benefits of three alternative open field burning control policies for the Willamette Valley. The model focused attention on the effects of regulating pollution generated by an industry (as opposed to a firm) in a general equilibrium framework that explicitly allowed for interindustry flows of materials. It included a state-of-the-environment function relating pollution directly to environmental quality, and offered new hypotheses concerning the latter and consumer activities. The three policies were a complete ban on open burning; open burning permitted once in 3 years; and alternate year burning; each policy was based on the adoption of a mobile field sanitizer. The alternatives were first investigated at the farm level of losses in consumer surplus, rents to Oregon seed producers, and gain in rent to non-Oregon seed producers. The benefits of improved visibility (increases in recreational activities) in the Willamette Valley were then determined. The implicit net total, average, and marginal costs of each policy are presented. The data show that improvements in visibility are produced under conditions of decreasing average costs. Thus the optimal level of visibility would necessarily be associated with revenue too small to compensate growers and consumers if visibility sold at a uniform inframarginal price. At nonoptimal levels of visibility, there would be inefficiency and a deficit or surplus to be managed. In either case, decreasing costs would be sufficient to recreate a public policy problem, and special arrangements would be required to achieve a welfare-maximizing solution.

1971

29746 **APTIC NO. 51620**

Sherwin, R. M., I. A. Raben, and P. P. Anas

ECONOMICS OF LIMESTONE WET SCRUBBING SYSTEM. *Office of Air Programs, Research Triangle Park, N. C., Div. of Control Systems, Proc. Int. Lime/Limestone Wet Scrubbing Symp., 2nd, New Orleans, La., 1971, vol II:745-763. 2 refs. (Nov. 8-12.)*

The factors affecting the costs of full-scale limestone wet scrubbing installations were investigated. The process and mechanical design criteria of greatest importance with respect to capital costs included corrosivity, erosion, scaling, local site factors, environmental impact, weatherizing, retrofit limitations, and operating controls. Operating costs and cost reduction techniques with respect to combined sulfur dioxide and particulate removal systems, process modifications, and layout changes are reviewed.

1967

29747 **APTIC NO. 51086**

Yoneda, Takeshi, Susumu Watanabe, and Koichi Iinoya

ECONOMIC DESIGN OF BAG FILTERS. *(Baggu firuta no keizai sekkei). Sangyo Kogai (Ind. Public Nuisance), 3(11):17-21, 1967. 6 refs. Translated from Japanese, 15p.*

Optimum economy in the design of bag filters is examined. The criteria include material and operating costs, investment expenses, operating characteristics, maintenance, and design variables. Design and operation are reviewed with respect to bag filter type, dust removal device, filter cloth, dust exhaust device, and operating temperature and pressure. The economic calculations are reviewed. In actual design, dust concentrations, collection efficiency, and filter cloth life must also be considered.

STANDARDS AND CRITERIA

1973

29748 **APTIC NO. 51212**

MONTANA AIR QUALITY STANDARDS. *Ind. Develop., 142(1):21-23, Jan./Feb. 1973.*

Emission standards in Montana are presented for incinerators, visible emissions, industrial processes, fuel burning equipment, wood-waste burners, primary non-ferrous smelters, slag treatment plants, kraft pulp mills, primary aluminum reduction plants, aluminum smelters, ponds, and aluminum manufacturing plants. Ambient air standards are given for smoke, sulfur dioxide, reactive sulfur, suspended sulfate, sulfuric acid mist, hydrogen sulfide, total suspended particulates, settled particulates, lead, beryllium, and fluorides. Emission rates based on process weight rates are given for particulate emissions. Ground-level sulfur oxide emission limits are also given.

29749 **APTIC NO. 51215**

NEVADA AIR QUALITY STANDARDS. *Ind. Develop., 142(1):24-25, Jan./Feb. 1973.*

Emission standards in Nevada are presented for visible emissions, incinerators, particulates from fuel burning equipment, and sulfur emissions from fuel burning and primary non-ferrous smelters. Maximum allowable concentrations are given for particulates, sulfur dioxide, carbon monoxide, photochemical oxidants, non-methane hydrocarbons, and nitrogen dioxide in the ambient air. Allowable rates of emissions based on process weight rates are given for particulate emissions from industrial sources.

29750 **APTIC NO. 51216**

ARIZONA AIR QUALITY STANDARDS. *Ind. Develop., 142(1):15-16, Jan./Feb. 1973.*

Emission standards in Arizona are presented for visible emissions, incineration, fuel burning equipment, process industries, copper smelters, fuel burning installations, sulfite pulp mills, sulfuric acid plants, and nitric acid plants. Maximum allowable concentrations are given for particulates, sulfur dioxide, nonmethane hydrocarbons, photochemical oxidants, carbon monoxide, nitrogen dioxide, sulfur compounds, and nitrogen oxides.

29751 **APTIC NO. 51217**

IDAHO AIR QUALITY STANDARDS. *Ind. Develop., 142(1):18-20, Jan./Feb. 1973.*

Emission standards are presented for Idaho for fuel burning equipment, visible emissions, incinerators, kraft pulping mills, wigwam burners, combined zinc/lead smelter operations, sulfuric acid plants, and particulate emissions from industrial processes. Maximum allowable sulfur dioxide ground-level limits are presented. Measuring intervals and concentrations are presented for particulates, sulfur dioxide, photochemical oxidants, hydrocarbons, nitrogen dioxide, carbon monoxide, settleable particulates, sulfuric acid mist, and beryllium. Allowable rates of emission based on process weight rates are given.

29752 **APTIC NO. 51218**

COLORADO AIR QUALITY STANDARDS. *Ind. Develop., 142(1):17, Jan./Feb. 1973.*

Colorado air quality standards are presented. Standards are presented for visible emissions and sulfur dioxide emissions. Concentrations, opacity, and equipment operating conditions are given. Regulations for fuel burning and refuse burning equipment and particulate emissions are given. Long-term and short-term ambient air standards are presented for suspended particulates and sulfur dioxide.

29753 **APTIC NO. 51228**

UTAH AIR QUALITY STANDARDS. *Ind. Develop., 142(1):30, Jan./Feb. 1973.*

Air quality standards in Utah are presented for visible emissions, total suspended particulates, and sulfur oxide emissions. Sources affected by the standards include: all industries with a process unit emitting 1 ton or more particulates annually; all coal-fired steam-electric power generating units; all coal-fired space heating units with rated input capacities of 50 million BTU/hr or greater; and all incinerators with rated charging capacities of 5 tons of waste/hr or more.

29754 **APTIC NO. 51229**

WYOMING AIR QUALITY STANDARDS. *Ind. Develop., 142(1):31-32, Jan./Feb. 1973.*

Emission standards in Wyoming are presented for visible emissions, particulate emissions from new and existing sources, wood waste burners, sulfuric acid mists, and fuel burning equipment. Maximum allowable concentrations are given for total suspended particulates, suspended particulates, sulfur oxides, sulfation, hydrogen sulfide, photochemical oxidants, hydrocarbons, nitrogen oxides, hydrogen fluoride, gaseous fluoride, and carbon monoxide. Emission rates based on process weight rates for particulates are given along with a formula to calculate emissions.

29755 **APTIC NO. 51254**

NEW MEXICO AIR QUALITY STANDARDS. *Ind. Develop., 142(1):27-28, Jan./Feb. 1973.*

Emission standards in New Mexico are given for wood waste burners, asphalt process equipment, non-ferrous smelters, pumice, mica, and perlite process equipment, oil burning equipment, gas burning equipment, coal burning equipment, sulfuric acid plants, cement kilns, gypsum processing plants, and kraft mills. Maximum allowable concentrations are presented for total suspended particulates, beryllium, asbestos, heavy metals, sulfur dioxide, hydrogen sulfide, total reduced sulfur, carbon monoxide, nitrogen dioxide, photochemical oxidants, smoke shades, and non-methane hydrocarbons. A formula is given for calculating emissions.

29756 **APTIC NO. 51398**

Japan Environmental Agency, Central Pollution Control Council

REVISION OF ENVIRONMENTAL STANDARDS INVOLVING OXIDES OF SULFUR AND ESTABLISHMENT OF ENVIRONMENTAL STANDARDS INVOLVING NITROGEN OXIDES AND PHOTOCHEMICAL OXIDANTS. *(Iwosankabutus ni kakaru kankyokijun no kaitei narabini chissosankabutsu oyobi kokagaku okushidant ni kakaru kyankyokikun no settei ni tsuite). Text in Japanese. 20p., April 1973.*

A new environmental standard for sulfur dioxide is proposed as 0.04 ppm or lower as a 1-day average of 1-hour values, and 0.1 ppm or lower as a 1-hour value. The conductometric method is the specified measurement method. The new nitrogen dioxide standard is 0.02 ppm or lower 1-day average of 1-hour values. Atomic absorption spectrophotometry using the Saltzman reagent should be used for NO2 measurements. The photochemical oxidant standard is 0.06 ppm or lower in terms of 1-hour values. Atomic absorption spectrophotometry using a neutral potassium iodide solution and coulometry are the suggested measurement methods. Samples should be taken at 1.5-10 m from the ground for all pollutants.

29757 **APTIC NO. 51281**

Fri, Robert W.

NATIONAL PRIMARY AND SECONDARY AMBIENT AIR QUALITY STANDARDS. PROPOSED SULFUR OXIDES SECONDARY STANDARD. *Federal Register, 38(87):11355-11356, May 7, 1973. 1 ref.*

A revision of the sulfur oxides secondary standard was proposed. The secondary standards include an annual arithmetic mean concentration of sulfur dioxide and a maximum 3-hour concentration not to be exceeded more than once per year. The revision includes the revoking of the annual standard, while not changing the 3-hour standard. The secondary 3-hour standard is 1300 micrograms/cu m (0.5 ppm) not to be exceeded more than once per year. An explanatory statement for the revision is included.

29758 **APTIC NO. 51658**

Iijima, Takashi

NITROGEN OXIDES AND THE ENVIRONMENTAL STANDARD. *(Chisso sankabutsu to kankyo kijun). Text in Japanese. Preprint, Fuji Techno-System Inc., Tokyo (Japan), 11p., 1973. (Presented at the Seminar on Comprehensive Countermeasure Against Nitrogen Oxides, Tokyo, Japan, Feb. 14-15, 1973.)*

Environmental standards for sulfur oxides, carbon monoxide, floating dust, lead, and nitrogen oxides are mentioned. Nitrogen oxides are mainly discussed. Measurement methods, sampling, spectrophotometry with the Saltzman reagent, measurement methods for photochemical oxidants, and air quality standards are discussed for NOx.

29759 **APTIC NO. 51324**

Quarles, John

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. EMISSIONS DURING STARTUP, SHUTDOWN AND MALFUNCTION. *Federal Register, 38(84):10820-10821, May 2, 1973.*

Standards of performance for new stationary sources, especially emissions during startup, shutdown, and malfunction are presented. New or modified sources in the categories of fossil fuel-fired steam generators, incinerators, portland cement plants, and nitric acid and sulfuric acid plants are required to meet standards for emissions of air pollutants which reflect the degree of emissions limitations achievable through the application of the best system of emission reduction. Attempts to classify all of the situations in which excess emissions due to malfunction, startup and shutdown could occur and the amount and duration of excess emission from each such situation indicated that it was not feasible to provide quantitative standards or guides which would apply to periods of malfunctions, startups, and shutdowns. A proposal is described by which EPA would be assured that new sources install the best adequately demonstrated technology and operate and maintain such equipment to keep emissions as low as possible.

29760 **APTIC NO. 51276**

Ruckelshaus, William D.

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. FEDERAL CERTIFICATION TEST RESULTS FOR 1973 MODEL YEAR. *Federal Register, 38(84):10868, May 2, 1973.*

Federal certification test results for 1973 model year motor vehicles and motor vehicle engines are presented. Federal emission standards, certification procedures, and certification data are given. Heavy duty gasoline-fueled engines are required to meet emission standards of 275 ppm for hydrocarbons, and 1.5% for carbon monoxide. Heavy duty diesel engines must meet Federal smoke emission standards of 40% opacity during acceleration and 20% opacity during lugging. The standards for automobiles prohibit all crankcase emissions, and limit allowable evaporative emissions from the fuel system and exhaust emissions from the tailpipe. Exhaust standards allow 1973 automobiles to emit no more than 3.4 g/mi of hydrocarbons, 39 g/mi of carbon monoxide, and 3.0 g/mi of nitrogen oxides from the tailpipe. The 1973 evaporative emission standard limits the loss of gasoline by evaporation from the carburetor and the fuel tank to no more than 2.0 g/test.

29761 **APTIC NO. 51277**

Ruckelshaus, William D.

MOTOR VEHICLE POLLUTION CONTROL SUSPENSION GRANTED. DECISION OF ADMINISTRATOR. *Federal Register, 38(80):10317-10330, April 26, 1973.*

The full text of the decision of the administrator of the Environmental Protection Agency on motor vehicle pollution control regulations suspensions is presented. Five major motor companies were granted a 1-year suspension of the motor vehicle regulations, but interim standards were prescribed simultaneously. Public hearings were held prior to formulating the decision. The national interim standards are based on a judgement that substantial progress was made in emission control since the manufacturer's 1973 certification program. The technology is available to meet the 1975 standards of 0.41 g/mi hydrocarbons, 3.4 g/mi carbon monoxide, and 3.1 g/mi nitrogen oxides. This technology is based on the use of catalytic converters, quick heat intake manifolds, air injection, fast release chokes, and improved ignition systems. The national interim standards were determined to be 1.5 g/mi HC, 15.0 g/mi CO, and 3.1 g/mi NOx which can be met by all manufacturers using the catalytic technology. Most manufacturers are expected to meet the interim standards without catalysts, using recalibrations and other components of their best systems.

29762 **APTIC NO. 51655**

Ueguchi, Nobuhiro

REGULATIONS ON NITROGEN OXIDES AND COUNTERPLANS AGAINST NOX. *(Chisso sankabutsu ni kansuru kisei no doko to sono taiosaku). Text in Japanese. Preprint, Fuji Techno-System Inc., Tokyo (Japan), 15p.,* *1973. (Presented at the Seminar on Comprehensive Countermeasure Against Nitrogen Oxides, Tokyo, Japan, Feb. 14-15, 1973.)*

The Japanese regulation for nitrogen dioxide is 0.02 ppm/hr/day or less. The standard for photochemical oxidant is 0.06 ppm/hr on the average. Environmental standards must take into account fixed and mobile sources. Agencies which control pollutants and control methods are mentioned. The standard for sulfur oxides is also mentioned.

1972

29763 **APTIC NO. 51057**

Subcommittee on Permissible Concentrations (Japan)

DOCUMENTATION OF PERMISSIBLE CONCENTRATIONS OF HAZARDOUS SUBSTANCES IN WORKING ENVIRONMENT. (BASIS OF PROPOSAL). *(Kyoyonodo to no kaisetsu (Teian riyu)). Sangyo Igaku (Jap. J. Ind. Health), 14(1):45-90, 1972. 429 refs. Translated from Japanese by Seizaburo Aoki, Japanese Language Translation Service, Fujisawa, 199p.*

Permissible concentrations of hazardous substances in the atmosphere are documented for the years 1963-1970. The bases for the proposals are given for each substance. For 1963 substances included: sulfuric acid, hydrochloric acid, nitric acid, hydrogen sulfide, ozone, acetic esters, methanol, gasoline, arsenious acid, beryllium, cadmium oxide, selenium, pentachlorophenol, and trichloroethylene. Substances for 1964 include: hydrogen fluoride, bromine, methyl ethyl ketone, carbon tetrachloride, acetone, inorganic phosphorus; for 1965: organic lead, xylene, hydrogen arsenide, tolylene diisocyanate, methyl chloride, vinyl chloride, chloroform, tetrachloroethane, monoethanolamine and industrial powder and dust causing pneumoconiosis. For 1966 the list includes: nitroglycol, ethyl ether, methyl isobutyl ketone, isopropyl alcohol, isoamyl alcohol, manganese, nickel carbonyl, ethylene oxide, dichloroethanes, methylene dichloride, chlorobenzene, orthodichlorobenzene, paradichlorobenzene, ethyleneimine, ethylenediamine, methylamine, normal hexane, cellosolve, cellosolve acetate, acrylonitrile, and vanadium; for 1967: nickel, ethyl chloride, dichloroethyl ether, butylamine, propyleneimine, zinc, and methylene-bis-phenyl isocyanate. the list for 1968 includes: iodine, phosgene, styrene, chloropicrin, and ammonia; for 1969: phosgene, toluene, butanol, zinc, and powder and dusts. The list for 1970 includes: amyl acetate, cyclohexane, cyclohexanol, cyclohexanone, and propyl acetate.

29764 **APTIC NO. 51103**

VDI (Verein Deutscher Ingenieure), Kommission Reinhaltung der Luft

EMISSION LIMITATION FOR DANGEROUS DUST. *(Emissionsbegrenzung fuer gefaehrdende Staeube). Rept. 3459, 9p., May 1972. Translated from German, 9p.*

Emission standards for various dusts of potential toxicity for humans, plants, and animals are reviewed. The types of dusts are evaluated according to their toxic action, particle size, solubility, and morphologic structure. Emission limitations are tabulated for dusts of arsenic, asbestos, beryllium, lead, cadmium, chromium compounds, fluorine compounds, mercury compounds, selenium, uranium, vanadium, tellurium, thallium, antimony, barium, iodine, quartz, soot, silver compounds, organic compounds (including anthracene, amines, naphthalene, and benzenes), strontium, tar, coal tar, zinc, aluminum compounds, ammonium compounds, bitumens, boron compounds, calcium compounds, cobalt, copper, magnesium oxides, molybdenum, nickel, phosphates, phosphorus compounds, silicon compounds, tobacco dust, bismuth, tungsten, and cement.

29765 **APTIC NO. 51195**

THE PACIFIC COAST STATES: CRADLE OF ENVIRONMENTAL ACTIVISM. *Ind. Develop., 141(6):18-34, Nov./Dec. 1972.*

The air and water quality standards adopted by Alaska, California, Hawaii, Oregon, and Washington are given. With the exception of California, the regulations are clear-cut and easy for industry to understand. All five states have aggressively enforced pollution control standards and are seeking to control undesirable growth through land use legislation or, in the case of Alaska, a coordinated land use and resource management policy. Pollution control financing and tax incentive programs are now offered by California, Oregon, and Washington. Air quality standards are listed for oxidants, carbon monoxide, lead, nitrogen dioxide, sulfur dioxide, suspended particulates, and hydrogen sulfide. Various emission standards are also listed, including those for incinerators, pulp mills, industrial processes and fuel burning equipment, board product industries, hot mix asphalt plants, sulfite pulp mills, and laterite ore production of ferronickel.

29766 **APTIC NO. 51328**

Bilger, R. W.

MOTOR VEHICLE EMISSION CONTROLS FOR AUSTRALIA. *Clean Air, 6(3):44-49, Aug. 1972. 18 refs.*

Comparison of recent air pollution data for Sydney and World Health Organization goals indicates that pollution from motor vehicles is the major air pollution problem at the present time and that the 1972/1974 Australian emission standards for new vehicles are insufficient to achieve the control required. Standards based on the best technically feasible method of control are advocated as the least costly approach to long-term control of automotive pollution. Recommendations are made for 90% control of carbon monoxide and hydrocarbons and 75% control of nitrogen oxides to become effective in 1977, at a cost to the consumer of $200/new vehicle, with an interim standard to be introduced in 1975. A suitable standard would be the 1972 California standard which limits hydrocarbons in exhaust to 1.5 g/mi, CO to 23 g/mi, and NOx to 3.0 g/mi and requires evaporative emissions control. Cost benefit studies should be undertaken of the implementation of U. S. 1975/1976 emission controls in Australia effective 1979. Air quality standards for oxidants, lead, sulfur dioxide, suspended particulates, and nitrogen dioxide are also listed.

29767 **APTIC NO. 51721**

Hatch, Theodore F.

THE ROLE OF PERMISSIBLE LIMITS FOR HAZARDOUS AIRBORNE SUBSTANCES IN THE WORKING ENVIRONMENT IN THE PREVENTION OF OCCUPATIONAL DISEASE. *Bull. World Health Organ. (Geneva), 47(2):151-159, 1972. 5 refs.*

The principal reasons for the differences in permissible exposure levels for various hazardous airborne substances that have been proposed by occupational health experts in different countries are discussed. Some of the limitations of lists of such values for use in the occupational health programs of countries in different stages of industrial development are described. The ILO/WHO Committee on Occupational Health in 1969 was unable to recommend a single set of values as international standards for more than a few toxic agents. The greatest differences are in the tolerance limits employed in the U. S. and in the U.S.S.R. The reasons for this substantial disagreement are discussed and are explained in terms of fundamental differences in the psychophysiological criteria employed to establish safe limits between the maintenance of good health and the development of a significant threat to the health. Some practical implications in the selection of permissible limits of exposure by developing countries are discussed in relation to living standards, endemic disease, climate, and geographical situation. (Author abstract modified)

29768 **APTIC NO. 51239**

Yamamoto, Takeo

POLLUTION AND THE RELATED FIELDS (II): ENVIRONMENTAL STANDARDS. *(Kogai to sono shuhen (II): Kankyo kijun). Text in Japanese. Kagaku to Yakugaku no Kyoshitsu (Chem. Pharm., Quart. J.), no. 36:5-10, 1972.*

The finally adopted environmental standard for sulfur dioxide is much less strict than the recommendation made by the committee on living environment based on the classifications of WHO. The present standard of 0.05 ppm for 70% of the total days of a year by the 24-hour average means a standard of less than 0.1 ppm by the hour index for 88% of the year. According to the WHO classifications, this standard is the second or third level of toxicity for the human body, and should cause 5% morbidity of chronic bronchitis cases for adult males older than 40 years. Setting of environmental standards reflect strongly the administrative and political pressures of a particular area and represents the industrial characteristics of the area. The environmental standards of the United States, the fundamental criteria for air quality, and the methods of measuring and meeting SO2 emission standards are discussed.

LEGAL AND ADMINISTRATIVE

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29769 **APTIC NO. 51279**

Fri, Robert W.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 38(92):12696-12714, May 14, 1973.*

Miscellaneous ammendments and clarification of the state implementation plans for the national ambient air quality standards are presented. Definitions, plan revisions, general requirements, compliance schedules, extensions, source list modifications, and rules and regulations are presented for California, Connecticut, Indiana, Nebraska, Oklahoma, Pennsylvania, Virginia, Washington, Wisconsin, Utah, Arizona, Nevada, New Mexico, Hawaii, Michigan, New Hampshire, New Jersey, Ohio, Rhode Island, Vermont, Wyoming, and the Virgin Islands.

29770 **APTIC NO. 51515**

Ishiguro, Tatsukichi

ACTUAL CONDITION IN TOKYO -- CONCERNING THE ENFORCEMENT OF THE LAW OF BAD ODOR PREVENTION. *(Tokyo-to no genjo -- akushu boshiho no shiko o megutte). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 2(10):41-52, March 1973.*

The Tokyo plan to control pollution is described. Complaints and petitions about bad odor are increasing in Tokyo. Odor sources include painting, printing, the chemical industry, stock raising, food processing, metal processing, plating, cleaning, car repairing, solid waste disposal, and drainage. Harmful gases and their measurement and control methods are discussed. Regulations and air quality standards for these harmful gases and odors are also mentioned.

29771 **APTIC NO. 51385**

Jackson, Henry

NATIONAL ENVIRONMENT POLICY ACT. *Preprint, National Wildlife Federation, Washington, D. C., 10p., 1973. (Presented at the National Wildlife Federation, Annual Meeting, 37th, Washington, D. C., March 17, 1973.)*

An Energy Facility Siting Act to be introduced in the Senate is designed to end an era of confrontation between industry and the public and to realize the objective of the National Environmental Protection Act -- protection of the environment through proper and intelligent balancing of the competing demands placed on our limited resources. This Act will vest the planning function in the government and public, rather than in the energy industries and private enterprise. It will establish a Siting Council to conduct long-term energy planning for facilities necessary to meet growing demand and to plan the shape and location of major energy facilities. In the case of major refineries, deep-water ports, pipelines, and power plants serving interstate markets, siting decisions would be preceded by Federal planning, by local, State, and Federal consultation, and would be subject to Council review and approval. The Council would be required to integrate environmental needs with energy requirements; representatives of all affected citizen groups will be involved in the decision making.

29772 **APTIC NO. 51660**

Kato, Mitsuo

THE UNITED NATION S COUNCIL FOR THE HUMAN ENVIRONMENT AND ENVIRONMENTAL RIGHTS. *(Kokuren ningen kankyo kaigi to kankyoken). Text in Japanese. Koshu Eisei (Public Health), 37(3):167-170, March 1973.*

The significance of the meeting of the United Nations Council for the Human Environment held in June 1972 in Stockholm is discussed. The Japanese Bar Association announced a strong advocate for the necessity of protective measures for the health and welfare of the people from the damages of public nuisances and for some legal measures for securing a healthy environment for individuals as their right. The environmental policy of the United States (1969), the Clean Air Act of 1970, the environmental protection law of the state of Michigan, the revised state constitution with measures for environmental protection in the state of Illinois, the environmental protection law of Sweden, and the national cultural laws of West Germany which includes protection of environmental rights are briefly mentioned as some references in the planning of future environmental protection legislation. The need for a quick expulsion of tragic environmental damages in Japan is discussed.

29773 **APTIC NO. 51320**

Kunz, Werner and Horst Rittel

PROJECT UMPLIS. *(Projekt Umplis). Text in German. Umwelt (Duesseldorf), 3(3):43-47, 1973. (Presented at the IBM Seminar on Environmental Protection and Data Processing, Bad Liebenzell, West Germany, Mar. 7, 1973.)*

The environment-planning-information system (UMPLIS) of the Federal Government of West Germany has the task of preparing laws and evaluating effects of planned and existing laws. It has to inaugurate measures for carrying approved laws into effect. Furthermore, it has to coordinate measures of various federal, state and municipal organs, to promote research and development, and to work out programs and guidelines of a policy to be persued. The nucleus of UMPLIS is a switchboard accepting questions and passing them on to the respective sub-system. The sub-systems are spider-web-like arranged around the switchboard. The most important subsystems are briefly outlined. Sub 1 is the central sub-system. It records questions coming from the switchboard and channels them for being answered. Sub 2 stores information from relevant information retrieval systems, for instance the Federal Bureau of Statistics, The West German Weather Bureau, and other institutions. Sub 3 contains information concerning experts in the field of environmental protection. Sub 4 provides connection with those institutions concerned with the continuous monitoring and measurement of pollutants. Other subsystems are planned. They shall include one concerned with limit values and standards, one with existing legal aspects, and one with pollution alert systems.

29774 **APTIC NO. 51280**

Meyers, Sheldon

COMMENTS ON ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING THE ENVIRONMENT. *Federal Register, 38(87):11369-11370, May 7, 1973.*

Appendices are presented to the comments made in writing by the Environmental Protection Agency on environmental impact statements and other Federal agency actions impacting the environment. Appendix I contains a listing of draft environmental impact statements reviewed; the list includes the Federal agency responsible for the statement, the number and title of the statement, the classification of EPA s comments, and sources for copies of the statements. Appendix II contains definitions of the classifications. Appendix III contains a listing of final environmental impact statements, the responsible Federal agency, the number and title of statement, a summary of the nature of EPA s comments, and the source for copies. Appendix IV contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and any other proposed actions.

29775 **APTIC NO. 51507**

Odaira, Toshio and Mitsuru Udagawa

DETERMINATION OF AIR POLLUTION AND DATA PROCESSING. *(Taikiosen no sokutei to deta shori). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot., vol. 4:50-65, March 1973. 19 refs.*

Air quality surveys should consider the number of measuring spots, at least one of which should be at the highest pollution area. Several spots should be in the most crowded area and several spots should be outside the area to evaluate the pollution entering the area. Stationing of measuring spots should take the future land use into consideration. Control programs should also be considered. The measurement station should analyze sulfur oxides by the conductivity method, nitrogen oxides by the Saltzman method, and carbon monoxide by nondispersion infrared spectrophotometry. Theoretical diffusion methods, multi-variable analyses, and statistical methods should be used to analyze the data. Information should also be available on pollution sources, fuel use, maximum allowable emissions from industries, and so on.

29776 **APTIC NO. 51201**

Rivers, Martin E.

STACK SAMPLING -- THE OTTAWA VIEW. *Water Pollution Control (Toronto), 111(1):37-39, Jan. 1973. (Presented at the Air Pollution Control Association, Ontario Section Meeting, Sept. 1972.)*

The sampling program implemented by the Canadian government control agency is reviewed. The program objectives include a review and application of testing procedures for stationary sources, acting as an advisory board, conducting stack sampling, establishing a source testing training facility, and evaluating new techniques and instruments.

29777 **APTIC NO. 51245**

Ruckelshaus, William D.

TRANSPORTATION AND ENVIRONMENTAL PROTECTION. *Traffic Quart., 27(2):173-181, April 1973. 10 refs.*

New and different styles of transportation are suggested to meet the urban/air pollution/transportation crisis. A variety of efforts to abate pollution from motor vehicles is presented. The Clean Air Act requires all the states to submit air pollution control plans that specify strategies for reaching and maintaining national standards during the next three years. The following plans have been considered in their plans: traffic control, parking restrictions, retrofit devices to reduce emissions from older cars, emission inspection and maintenance programs, conversion of fleet vehicles to gaseous fuels, new or improved mass transit systems, staggered working hours, and land use controls, such as siting limitations on new highways and parking lots. It seems that mass transit must be deliberately employed in more urban areas to solve the transportation problems.

29778 **APTIC NO. 51384**

Ruckelshaus, William D.

QUO VADIS, ENVIRONMENT? Preprint, National Wildlife Federation, Washington, D. C., 13p., 1973. (Presented at the National Wildlife Federation, Annual Meeting, 37th, Washington, D. C., March 17, 1973.)

Progress in environmental management includes an enormous escalation in funding for pollution control purposes. Since July 1970, Federal funding for municipal waste water treatment plants has amounted to $8.9 billion or almost three times as much as was appropriated in the previous 15 years. Total national expenditures -- public and private -- for pollution control will rise from $10.5 billion in 1970 to $33.3 billion in 1980. These funds will result in a much cleaner environment, as already evidenced by substantial drops in atmospheric sulfur dioxide, particulates, and nitrogen oxides. Regulatory measures under the Clean Air Act will speed up this process in the mid-70 s. Legislation has also been enacted in the last 2 years to control water pollution, pesticides, and noise, and efforts are underway to provide broad public participation in hearings on the implementation of the legislation. Among proposals still before Congress are bills on toxic substances, sediment control, power plant siting, transportation management, land planning, and ocean dumping. The future may see a careful analysis of the consequences of growth and of the fundamental socioeconomic and demographic reforms necessary to consolidate gains in environmental protection.

29779 **APTIC NO. 51700**

Ruckelshaus, William D.

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. MOTOR VEHICLE CERTIFICATION PROCEDURES. *Federal Register, 38(37):5183-5192, Feb. 26, 1973.*

The control of air pollution from new motor vehicles and new motor vehicle engines is discussed. Motor vehicle certification procedures for testing facilities are described. Application for certification, approval of procedure and equipment test fleet selections, testing by the administration, maintenance of records, submittal of information, and right of entry are reviewed.

29780 **APTIC NO. 51246**

Sansom, Robert L.

AGENCY COMMENTS ON ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING THE ENVIRONMENT. *Federal Register, 38(78): 10133-10135, April 24, 1973.*

A listing of draft environmental impact statements is reviewed. The list includes the Federal agency responsible for the statement, the number, and the title of the statement. The classification of the nature of the EPA s comments is defined. A listing of final environmental impact statements is reviewed. A listing of proposed Federal agency regulations is also presented. The EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonable available alternatives. The agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

29781 **APTIC NO. 51278**

Sansom, Robert L.

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. NOTICE OF OPPORTUNITY FOR PUBLIC COMMENT ON PROPOSED TRANSPORTATION AND/OR LAND-USE CONTROL STRATEGIES. *Federal Register, 38(81):10464-10466, April 27, 1973.*

A notice of opportunity for public comment on proposed transportation and/or land-use control strategies was presented. The public was notified that proposed implementation plans from Washington State, Oregon, New York, and Illinois were received by the Environmental Protection Agency. Public comment is invited on whether the proposed control strategies should be approved and on the proposed extensions of deadlines.

29782 **APTIC NO. 51118**

Schuermann, Heinz-Juergen

PREREQUISITES OF AN ECONOMICALLY RATIONAL ENVIRONMENTAL POLICY. *(Wirtschaftspolitische Voraussetzungen einer oekonomisch- rationalen Umweltpolitik). Text in German. Glueckauf (Essen), 109(12):640-646, June 7, 1973. 21 refs.*

Three economically rational strategies toward an environment-protecting policy are recommended. They include polluter oriented environment protection taxes, the introduction of licenses for using the environment, and regulations which are target-oriented but not individually compelling. Calculation of the taxes may be based on the regional emission conditions which can be determined with the aid of diffusion models. For the license strategy the emission loads tolerated by society are transformed into politically allowable emission quantities. Licenses which entitle one to a certain environmental pollution are granted. The price for the licenses is based on the demand for such licenses. The third strategy is explained on the basis of the desired reduction of the lead level in gasolines. The desired lead level of 0.4 g/l or less can be reached by taxing the lead addition in proportion to the amount added to the gasoline. Those who find it extremely difficult and expensive to adjust to the desired lead level will rather pay the tax, those who find it easy will go even below the required level so that in the end the same result is achieved by uniformly imposing a regulation on everybody concerned.

29783 **APTIC NO. 51661**

Shimazu, Yasuo

THE ENVIRONMENT AND MAN. *(Kankyo to ningen). Text in Japanese. Koshu Eisei (Public Health), 37(3):153-160, March 1973.*

Planting of green trees does not solve the problem of air pollution where there are no animals and bacteria. The total amount of dead leaves on the ground waiting for decomposition is 1.5 times over the total living vegetation. Therefore, the roadside trees, of which dead leaves are swept away and discarded, where there is no bacteria for decomposition, are hardly a solution for air pollution. The future prospect that the total amount sulfur oxides will increase four times over the present amount is only a prospect for the overall average. Locally, the concentration will be far worse than 400%. In the relationship of production and consumption, the Kanto area produces only 87% of goods required for its own comsumption; 3.5% of the public nuisance created in the Osaka-Kobe area is caused due to production for the Kanto consumers. Leveling off of overflowing population means equal distribution of pollution; the decrease of pollution in one area means an increase in another area.

29784 **APTIC NO. 51716**

Tomalin, E. F. J. and R. A. L. Davis

PETROCHEMICAL WORKS AND THE ALKALI AND C ACT. *Chem. Engr. (London), (272):197-203, April 1973. 2 refs. (Presented at the Royal Aeronautical Society, London and South Eastern Branch, London, England, Nov. 9, 1972.)*

This paper describes the types of petrochemical process emission which the Alkali Inspectorate seeks to control according to the Alkali Act and the negotiations with the Inspectorate during the design and construction of the factory which were necessary to reach an agreed conclusion. Reference is also made to the operation of the best practical means concept and the demands of other statutory authorities which may conflict with the requirements of the Alkali Inspectorate. The act contains a very small number of statutory limitations on emissions of hydrochloric acid and on total acidity expressed as sulfur trioxide from certain types of sulfuric acid plants. The approach of the Inspectorate is described. It seems that it is not possible to develop any accurate guidelines to the requirements of the Alkali Inspectorate in relation to any particular class of petrochemical plant. However consideration of typical emissions of combustion gases, hydrocarbons, odors, heavy metals, and solids related to a number of major units designed and constructed over the last few years will indicate the lines along which negotiations may be acceptable and the height above ground at which these may be discharged. Flares, cooling towers, and storage tanks are also briefly mentioned.

29785 **APTIC NO. 51400**

Train, Russell E.

LAND USE: NUMBER ONE PRIORITY OF THE FUTURE. *Preprint, National Wildlife Federation, Washington, D. C., 13p., 1973. (Presented at the National Wildlife Federation, Annual Meeting, 37th, Washington, D. C., March 17, 1973.)*

Improved land use is the number one environmental priority facing the nation, and Congress should not delay in enacting an effective land use bill. The Administration has introduced legislation calling for controls at the State level and providing that states without adequate land use programs would lose from 7-21% of their highway trust funds, airport construction funds, and land and water conservation funds. Without tough sanctions, the bill will never work. The President has also sent Congress strong legislation to regulate surface mining. The premise of the Administration bill is that no strip mining should be allowed unless it meets specific and very tough Federal performance standards. If an area cannot be effectively reclaimed, it is not to be mined. Mineral leasing legislation sponsored by the Administration contains the same provisions, thus assuring that mining on Federal lands is subject to the same strict reclamation provisions imposed on the states. No unreasonable delay in compliance with Federal standards should be allowed. Congress should also amend tax laws to make coastal wetlands less attractive to developers. The Administration s Environmental Protection Tax Act does this by shifting the full costs of altering wetlands from the public to the developer.

29786 **APTIC NO. 51376**

Troxler, K. H.

FAST AND WITH LITTLE EXPENDITURE. *(Rasch und mit wenig Aufwand). Text in German. Umwelt (Duesseldorf), 3(3):34-35, 1973.*

Zurich has created a coordinating group with the tasks of supervising an urgent program for the disposal of solid waste in Zurich, measures for the protection of Lake Zurich, education in schools and of the public, and an information program for municipalities. Moreover, it is actively engaged with working out measures for emission protection along streets and with a study of emission tolerance in the area of Zurich. The coordinating group is a connective body to the Bureau of Environmental Protection in Bern. This Bureau is still in the process of being organized. The coordinating group is also a contact link to environmental protection offices in all other cantons and municipalities. All complaints concerning environmental pollution are to be addressed to the coordinating group.

1972

29787 **APTIC NO. 51036**

TRW Transportation and Environmental Operations, Mclean, Va.

TRANSPORTATION CONTROL STRATEGY DEVELOPMENT FOR THE DENVER METROPOLITAN AREA. (FINAL REPORT). *Office of Air and Water Programs Contract 68-02-0048, Proj. DU-72-B895, Pub-APTD-1368, 137p., Dec. 1972. 20 refs.*

NTIS: PB 219260

The nature of the air quality problem attributed to motor vehicle operation is demonstrated. The magnitude of the problem and a strategy are developed to neutralize these effects in order that national ambient air quality standards may be attained and maintained. Conclusions and recommendations are presented from the qualitative and quantitative analyses of existing data for the control of transportation related carbon monoxide and hydrocarbon emissions. Implementation plan review, identification of transportation controls, estimate of air quality impact, documentation of implementation obstacles, and formulation of surveillance review process are performed. Control strategy includes engine operation modifications, retrofit of pre-1968 cars, inspection, maintenance, improved mass transportation, and car pooling.

29788 **APTIC NO. 51068**

Ministry of Health and Welfare (Japan), Environmental Pollution Control Dept.

ON THE ESSENTIALS OF TENTATIVE COUNTERMEASURES AGAINST ENVIRONMENTAL POLLUTION BY CADMIUM (OUTLINE). *(Kadomyumu ni yoru kankyo osen zantei taisaku yoryo ni tsuite (yoyaku)). In: Kadomyumu Kankyo Osen Taisaku (Countermeasures Against Environmental Pollution by Cadmium), p. 109-114, March 1972. Translated from Japanese by Seizoburo Aoki, Japanese Language Translation Service, Fujisawa, 8p.*

An outline of tentative control methods was devised on the basis of investigations of cadmium pollution in Japan. The outline deals with two main points: investigation of environmental cadmium contamination -- the prosecution of an inquiry into the amount of Cd absorbed by man by medical examinations of the residents; and countermeasures against environmental Cd contamination, including improvement of sanitary conditions, diminution in the quantity of Cd absorbed by man, and measures against sources of pollution. Guidelines are given for investigations of cadmium concentrations in air, soil, and water systems and their analysis. Standard concentrations are suggested for water and air. With regard to emissions, Cd concentration in air was set at 0.88-2.93 micrograms/cu m. Research and investigations performed to date and the resultant suggested countermeasures are listed.

29789 **APTIC NO. 51196**

REVENUE BONDS: A LOW-COST INCENTIVE TO CLEAN UP. *Ind. Develop., 141(6):8-9, Nov./Dec. 1972.*

Revenue bond financing of pollution control systems is burgeoning in the 37 states that permit bonds to be floated for such projects. In 1973, the total amount of issues for pollution control purposes should reach between $1-1.5 billion compared with $65 million in 1971. The main attraction of the bonds is low-cost--interest rates to the borrower which average about 2% below taxable straight corporate bonds. In addition, the firm leasing the facility retains the right to take depreciation on the equipment because the financing is structured as installment sale. And if the pollution control system is installed in a plant built before 1969, the corporation has the right to amortize the cost of control equipment over five years. Pollution control bonds are exempt from time-consuming SEC registration.

29790 **APTIC NO. 51468**

Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Monitoring

NERC/RTP RESEARCH PROJECTS - FISCAL YEAR 1973. SUMMARIES OF INTRAMURAL AND EXTRAMURAL ACTIVE RESEARCH PROJECTS. *EPA-RS-72-005, 553p., Oct. 1972.*

NTIS: PB 220259

Summaries and abstracts of intramural and extramural active research projects conducted at the National Environmental Research Center are presented. Listed are projects in the divisions of health effects research, control systems, chemistry and physics, meteorology, atmospheric surveillance, criteria development, ecological research, primate laboratory, and radiation laboratory. Project titles, method of support, and institutions doing the research work are listed.

29791 **APTIC NO. 51701**

HEALTH LAWS AND REGULATIONS. *Intern. Digest Health Legislation, 23(2):416-420, 367-381, 222-224, 444, 215-219, 1972.*

Various regulations dealing with air quality standards and health in the United States and Mexico are reviewed. National primary and secondary ambient air quality standards are presented for sulfur dioxide, particulates, carbon monoxide, photochemical oxidants, hydrocarbons, and nitrogen dioxide, and their definitions, scope, and reference conditions are discussed. Miscellaneous provisions for noise control and public health administration are listed. The 1970 Clean Air Act is reviewed, and short discussions are presented of the following: research, state and regional grant programs, interstate air quality agencies, air quality control regions, criteria and control techniques, national ambient air quality standards, implementation plans, performance standards for new stationary sources, national emission standards for hazardous air pollutants, enforcement, inspections, monitoring, retention of state authority, control of pollution from Federal facilities, motor vehicle emission standards, compliance with standards, fuel regulations, and emission standards for aircraft. The control of alcohol abuse and alcoholism, the manufacture of pharmaceutical products, and general provisions for controlling air pollution are reviewed. Prevention and control of air and water pollution in Mexico is also discussed.

29792 **APTIC NO. 51466**

Berry, Edgar P.

POLLUTION OF THE ENVIRONMENT IN THE CITY OF NEW YORK. *N. Y. Med., 28(8):296-301, Aug. 1972. (Presented at the Tokyo/New York Congress, 5th, Tokyo, Japan.)*

The City of New York has made progress towards effective control of air pollution, but the environment is far from being truly healthful for its inhabitants. The code of Aug. 1971 places stricter limits on the sulfur content of fuel than had prevailed previously, restricts nitrogen oxide and sulfur dioxide emissions from electric power plants, bans leaded gasoline by the end of 1973, prohibits spraying of asbestos compounds in building construction, restricts volatility of gasoline, forbids the use of certain photochemically reactive solvents, and strengthens the regulations that are already in existance. The code also establishes and environmental court system which will improve the enforcement by removing all pollution violations from the criminal courts. In an effort to enlist the cooperation and support of the medical profession in reducing the adverse effects of air pollution on the population, the New York Health Department last fall issued an advisory bulletin to all physicians in the city. Noise and water pollution and solid waste control are also discussed.

29793 **APTIC NO. 51544**

Boije, Loyd

MALMO ESTABLISHES A MONITORING STATION FOR AIR POLLUTION CONTROL. *Environ. Health, 80(10):342-345, Oct. 1972.*

A centrally situated permanent control station equipped for the measurement of different air pollutants and for meteorological observations is described. Initial costs for the equipment and the associated computer program are relatively high. Significant savings are achieved in the long term through rationalization compared with earlier control systems. The volume of the information is increased considerably while the performance of the equipment is readily adoptable to the different demands which may be made on it in the future. Various auxiliary equipment of the monitoring stations is described. Data registering and computer programming are discussed. The evaluated data received from the computer can be put to use in a number of ways.

29794 **APTIC NO. 51560**

Carroll, Thomas E.

UPDATING THE POLICIES AND ACTIVITIES OF THE ENVIRONMENTAL PROTECTION AGENCY AS RELATED TO THE MINING INDUSTRY. *Mining Congr. J., 58(12):61-63, Dec. 1972.*

The economic impact of the programs of the Environmental Protection Agency administered at different points around the country is discussed. Problems of sulfur oxide control technology in the copper, lead, smelting zinc, aluminum, steel, and coal mining industries are discussed. Primary and secondary standards of the Clean Air Act are described. Two regulations expected on gasoline would limit lead in leaded gasoline to 2.0 micrograms/cu l in 1974, scaled down to 1.25 micrograms/cu l by 1977. And the second regulation to provide for the availability of at least one brand of unleaded gasoline for automobiles beginning in July 1975. Air quality is a prime problem for copper producers. A list of seven studies shows that 90 to 700 million dollars investment costs through 1976 will be needed. Lead and zinc regulations combined are expected to require investment costs of $130 million.

29795 **APTIC NO. 51357**

Cowan, David J.

ENVIRONMENTAL TOPICS IN AN UNDERGRADUATE PHYSICS CURRICULUM. *Am. J. Phys., 40(12):1748-1756, Dec. 1972. 108 refs.*

The number of bachelor s degrees in physics conferred annually is predicted to decline. This decline may be abated by emphasizing the versatility of an undergraduate physics degree. The introduction of environmental topics throughout the undergraduate curriculum is one method of illustrating this flexibility, and this approach is presented. Examples of the applications of physical principles to several areas of air environmental change are given. These areas are air pollution, energy conversion and resources, environmental radiation, noise, thermal pollution, transportation, and water pollution. Representative bibliographies are presented in each area to facilitate the introduction of these topics into the curriculum. No major changes are proposed for the standard undergraduate physics curriculum, although a course in fluid mechanics or transport phenomena would provide a valuable background for students of all interests. (Author abstract modified)

29796 **APTIC NO. 51365**

Jacob, M.

ENVIRONMENTAL HEALTH IN SWEDEN. *Environ. Health, 80(11):453-454, Nov. 1972. 4 refs.*

A special Environmental Franchise Board which acts with court status and on the lines of impartial arbitral tribunal issues licenses or must be notified of industrial or commercial installations requiring scrutiny from environmental aspects. Cement factories, dairies, abattoirs, breweries, meat packing plants, vegetable canneries, fruit canneries, laundries, and refuse disposal plants are required to obtain licenses. An Act of 1968 prohibits the burning of fuel oil with a higher sulfur content than 2.5% by weight. Local regulations may further restrict the maximum permissible levels, and for Stockholm city center the figure has been reduced to 1%. Food hygiene standards are extremely high in slaughterhouse, food factory, and retail premises. Hygiene inspectors are discussed.

29797 **APTIC NO. 51272**

Murphy, R. P.

AIR POLLUTION AND THE MOTOR VEHICLE. *SAE-Australasia, 32(5):168- 175, Nov./Dec. 1972. 20 refs. (Presented at the Society of Automotive Engineers, National Convention, 71st, Melbourne, Australia, Oct. 21, 1971. Paper 16.)*

In central Sydney the carbon monoxide concentrations being recorded are comparable to major cities in the world and the first signs of the development of a photochemical pollution problem have occurred. Oxidant concentrations have not yet reached values which cause irritation to man, but emissions of hydrocarbons and oxides of nitrogen, either unchanged or by reaction with the atmosphere, do appear to be contributing to the brown haze which is obvious in the Sydney basin on many mornings. Action resulting in the reduction of emissions from motor vehicles is the most important step required to control air pollution in major Australian cities at this time. Improved legislation and standards to control emissions from major vehicles is necessary, and the steps now being taken in New South Wales and at the Federal level to prepare such legislation and standards should result in developments towards control. The decision to use the Economic Commission of Europe test procedures seems appropriate as the average operating cycle in cities such as Sydney would more nearly parallel the European situation than that in the U. S.

29798 **APTIC NO. 51198**

Reilly, F. X.

TAX EXEMPT REVENUE BONDS EASE INDUSTRY S POLLUTION BURDEN. *Ind. Develop., 141(6):16-18, 1972.*

Meeting current and projected standards for air and water quality will cost industry from $20 billion to more than $100 billion. As a result of this burden, revenue bond financing is enjoying a resurgence through tax exempt bonds used especially for pollution control projects. Pollution control financing will amount to about $750 million in 1972, compared with $65 million in 1971, and will probably increase to $1-1.5 billion in 1973. The tax-exempt bonds offer industry the advantages of interest rates 2% lower than those on taxable, straight corporate bonds; financing by lease, installment purchase, or other legal device; and access to funds that are not often available, such as insurance companies, trust accounts, and commercial banks. However, successful financing depends on close cooperation between industry and government, as illustrated by one company s experience with the Ohio Water Development Authority, established to encourage the construction of waste water treatment facilities. Other important aspects of pollution control financing are the selection of knowledgeable bankers, the need to promote financial aid from the Federal government, the possibility of more stringent control standards, and anticipated problems in defining facilities that qualify for tax-exempt status. The latter will be true especially in the areas of recycling and air pollution control where manufacturing processes are directly involved.

29799 **APTIC NO. 51297**

Smeets, J.

PUBLIC HEALTH ASPECTS OF THE EUROPEAN COMMISSION S ENVIRONMENTAL POLICY. *Environ. Health, 80(11):436-439, Nov. 1972.*

The European Communities have been dealing with environmental problems in the light of the three treaties which form the base of this community: the Treaty of European Economic Community, the Euratom Treaty, and the Treaty creating the European Coal and Steel Community are discussed. The following polluting substances will be considered with priority to establish criteria and to adopt joint measures: sulfur dioxide and particles in suspension, lead and lead compounds, nitrogen oxide and photochemical oxides, and carbon oxides. In the second stage, chlorine, hydrochloric acid, fluorine, fluorine compounds, hydrocarbons, carcinogenic products, nickel, and cadmium will follow. The implementation plan is described.

29800 **APTIC NO. 51248**

Wendorff, D.

ENVIRONMENTAL HEALTH IN THE FEDERAL REPUBLIC OF GERMANY. *Environ. Health, 80(11):450-452, Nov. 1972.*

Environmental problems in the Federal Republic of Germany are described. The contaminants of air are classified in two categories such as substantial air pollution and energy contamination. The substantial air pollution consists of carbon monoxide, sulfur oxides, nitrogen oxides, hydrochloric acid, fluorides, heavy metal compounds, radioactive substances, and fine dust. The following plans are necessary for effective planning: air purification plans, control stations for continuous measurement of emissions, installation of a smog warning system for special areas, central documentation of emissions from industrial and nuclear plants, introduction of standards for machines, and development of guidelines for planning and for the construction and erection of buildings. The Federal government s control program and the Public Health Institute of Schleswig Holstein are described. The education, training, and employment of health engineers are also discussed.

1971

29801 **APTIC NO. 51602**

IMPLEMENTATION PLAN FOR THE COMMONWEALTH OF VIRGINIA. (FINAL REPORT). *International Business Machines Corp., Gaithersburg, Md., Federal Systems Div., Air Pollution Control Office Task Order 7, BOA 68-03-0043, 670p., Nov. 23, 1971.*

The Virginia Implementation Plan for control of air pollution by 1975 and beyond deals primarily with those regions and pollutants where frequent daily amounts and some average annual means are already exceeding National Air Quality Standards. The regions and pollutants are: Region 6, Norfolk, for particulates, Region 5, Richmond, for sulfur dioxide, and Regions 5, 6, and 7 (Northern Virginia) for traffic-related pollutants including carbon monoxide, hydrocarbons, nitrogen oxides, and total oxidants. The principal control strategy for all pollutants is that of analyzing and comparing air quality data with emission inventory data, and then applying a proportional reduction model. The proportional model, based on annual emissions and averaged observations, averages out weather factors because of their short period characteristics. Local meteorological biases are specified in detailed analyses, where they appear to have a strong bearing on air quality observations. Emission inventories are given by region. Virginia air pollution regulations, including sampling and analyses, are specified together with compliance procedures for new and existing point sources, a registration system, actions required to prevent air pollution emergency episodes, and the powers and duties of the State Air Pollution Control Board. The functions of local air pollution control agencies and of the Eastern Tennessee Southwestern Virginia Interstate Air Quality Control Region are reviewed.

29802 **APTIC NO. 51459**

Voorhees, Alan M., Salvatore J. Bellomo, Robert L. Morris, Stephen C. Nelson, Joseph Brevard, Edward Mierzejewski, Sally D. Liff, Edward Edgerley, Jr., Frederick Brunner, and Kenneth W. Axtell, Jr.

A GUIDE FOR REDUCING AIR POLLUTION THROUGH URBAN PLANNING. *Voorhees (Alan M.) and Associates, Inc., McLean, Va. and Ryckman, Edgerley, Tomlinson, and Associates, St. Louis, Mo., Office of Air Programs Contract CPA 70-100, 101p., Dec. 1971. 43 refs.*

NTIS: PB 207510

Eleven land use/public facility planning strategies and five transportation strategies which are of potential use in the reduction of air pollution impacts are evaluated. Techniques for the implementation of these strategies are also examined. Many of the actions that would be beneficial could also have ancillary harmful effects. The most important relationships for consideration in an urban planning program are investigated. Planned relationships among industrial, commercial, and residential land use can reduce concentrations of aerial wastes. More effective use of large open spaces and green belts can disperse pollutant concentrations and the number of people exposed to unacceptable air pollution levels. Significant reduction in hydrocarbons and carbon dioxide can be gained through effective highway planning. Improved public transportation can reduce vehicular travel and vehicular emissions. Transportation facilities coordinated with adjoining land use, control of arterial and freeway operations, traffic flow improvements, and the selective creation of traffic-free zones can be significant for both short and long-range reduction of automotive pollutants. Abatement legislation, alternatives to urban planning, major pollutants and sources, site conditions, and some air pollution controls are reviewed.

1970

29803 **APTIC NO. 51644**

Public Health Service, National Air Pollution Control Administration

REPORT FOR CONSULTATION ON THE METROPOLITAN OMAHA INTERSTATE AIR QUALITY CONTROL REGION (NEBRASKA AND IOWA). *APTD-1187, 73p., March 1970. 4 refs.*

NTIS: PB 215380

This report contains a proposal for the boundaries of the Metropolitan Omaha Intrastate Air Quality Control Region to comply with the Clean Air Act, following evaluation of technical, urban, and governmental factors. The report is intended to serve as a background document for the formal consultation between the National Air Pollution Control Administration and the appropriate state and local authorities. The technical factors study takes account of the location of pollution sources and the geographic extent of serious pollutant concentrations in the ambient air. Pollution sources are identified through an inventory of emissions from power generation, industrial operations, space heating, water disposal, and other pollution causing activities. The transport and distribution of pollutants in the ambient air are analyzed on the basis of measured air quality data, the location of emissions, meteorological data, and topographic information.

29804 **APTIC NO. 51645**

Public Health Service, National Air Pollution Control Administration

REPORT FOR CONSULTATION ON THE METROPOLITAN OKLAHOMA CITY INTRASTATE

AIR QUALITY CONTROL REGION (OKLAHOMA). APTD-1186, 72p., March 1970. 8 refs.

NTIS: PB 215013

This report contains a proposal for the boundaries of the Oklahoma City Intrastate Air Quality Control Region to comply with the Clean Air Act, following evaluation of technical and urban factors. The report is intended to serve as the background for the formal consultation between the National Air Pollution Control Administration and the state and local authorities. Urban factors are geography of the region, present population, economic activity, prospective population, economic growth, and probable direction of physical growth. The total quantity of pollutants emitted, emission inventory, the geographic pattern of emission sources, topography, meteorology, and patterns of pollutant dispersion factors were investigated in determining the boundaries of an air quality control region.

29805 **APTIC NO. 51651**

Public Health Service, National Air Pollution Control Administration

REPORT FOR CONSULTATION ON THE VIRGIN ISLANDS AIR QUALITY CONTROL REGION. *APTD-1193, 38p., March 1970. 2 refs.*

NTIS: PB 215330

The regional approach to air quality control and a federal proposal for the Virgin Islands area air quality control region as required by the Clean Air Act are described. The engineering evaluation for the Virgin Islands area was based on a study of topography, air pollutant emissions, meteorology, and air quality levels. The emission inventory indicated the location of point and area sources and the quantity of pollutants emitted from these sources. Emission densities were calculated for each individual island based on the estimated quantity of each pollutant. Sulfur dioxide, total particulates, carbon monoxide, hydrocarbons, and nitrogen oxides were inventoried for main sources. Sulfur oxides, total particulates, and carbon monoxide were considered since they provide an indication of the general geographic extent of the overall problem. Urban factors such as population and industry were evaluated.

29806 **APTIC NO. 51472**

Pawlak, L.

LEGISLATURE AND ORGANIZATION OF THE ATMOSPHERIC AIR POLLUTION CONTROL IN POLAND. *(Prawodawstwo i organizacja ochrony powietrza atmosferycznego w Polsce). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(4):17-23, 1970. (Presented at the French-Polish Symposium on Air Pollution Control, Paris, France, Nov. 17-21, 1969.)*

NTIS: TT 70-55124/4

The legal aspects of air pollution control in Poland are reviewed. The preliminary steps included establishing control agencies to draft standards, examine plans and projects for pollution potential, and supervise the observance of regulations. The major responsibility for pollution control, however, was vested within the industries themselves, with obligations including the construction and installation of pollution controls, emission measurements, establishing protection zones, air pollution forecasting under specified conditions, and process modifications. Standards have already been set for sulfur dioxide, sulfuric acid, nitrogen oxides, hydrogen sulfide, carbon monoxide, and nontoxic dusts.

SOCIAL ASPECTS

1972

29807 **APTIC NO. 51483**

Wall, G.

PUBLIC RESPONSE TO AIR POLLUTION IN SHEFFIELD, ENGLAND. *Preprint, Man and Environment Commission, 24p., 1972. 34 refs. (Presented at the Man and Environment Commission, International Geographical Congress, 22nd, Calgary, Canada, July 1972.)*

A survey was undertaken to determine if public perception of air pollution in Sheffield, England, coincided with the facts as revealed by air pollution data, i.e., substantial reduction in smoke pollution and considerable reduction in sulfur dioxide pollution; public knowledge of smoke control legislation; and attitudes to alternative adjustments to air pollution. Forty questionnaires were completed in each of three study areas: a predominantly residential area where pollution levels had fallen 25% since 1962; a comparatively clean high-density housing and industrial area; and a slum clearance area outside the smoke control zone. Most respondents were able to offer a personal definition of air pollution and exhibited considerable knowledge of smoke control legislation. However, a larger proportion of persons were unable to define pollutants, most showing a lack of appreciation of gaseous pollutants. There was a close association between pollution levels and the perception of pollution as a problem, but little relationship between pollution levels and individual action to combat pollution as measured by the number of complaints to the Public Health Department. With the exception of the slum clearance area, most people did not regard air pollution as an important problem. The results suggest a complacency that could lead to a relaxation of efforts to curb air pollution. Smoke and sulfur dioxide levels for the area are listed.

1971

29808 **APTIC NO. 51580**

Chiba Prefecture (Japan), Dept. of Hygiene

REPORT ON THE INVESTIGATION OF THE CITIZENS CONSCIOUSNESS OF PUBLIC NUISANCE. *(Kenmin no kogai ishiki chosa hokokusho). Text in Japanese. 75p., July 1971.*

A questionnaire was given to 3000 citizens of Chiba prefecture between March 20 and April 20, 1971, to investigate the opinions of citizens on public nuisance. The recovery rate was 45.5%; the answers consisted of 64.4% male and 35.6% females. Those in the 30s and 40s formed 49.3% of the total returns. Those who felt that they were victimized by pollution were 59.1%, and those who felt unaffected were 26%. About 18% felt they could not tolerate the situation, and 43% felt they could manage but did not condone the situation. Air pollution was the most damaging type of public nuisance to 38.2% of the people; noise to 27.4%; and water pollution to 17.4%. In the capital area, 36% felt that they were victimized by air pollution, whereas only 6-6.7% of rural population blamed air pollution. With regard to their opinion on industrial development, 60.3% felt that they could acquiesce to the situation if pollution control facilities were installed with the construction of factories; only 4.9% felt that industrial development should be discontinued to eliminate new pollution sources.

GENERAL

1972

29809 **APTIC NO. 51372**

AIR POLLUTION IN EUROPE. *World Health Organization Chronicle (Geneva), 26(5):219-223, 1972. 3 refs.*

As a result of intensive industrial development, a rising population, and a continual increase in wastes of all kinds, Europe is rapidly approaching a point at which pollution of the environment may present a dangerous threat to man. Most countries in Europe have set up monitoring systems for the measurement of air pollution levels. Most of these systems undertake measurements of smoke and sulfur dioxide, but some cover a wider range of pollutants. Two basic approaches to air pollution control, air resources management and best practicable means, are discussed. Air pollution of domestic origin, motor vehicles, aircraft is discussed. Comparatively few countries have legislation restricting air pollution caused by emissions from domestic heating and cooking appliances. The most usual form of control is through legislation on the planning and siting of new housing developments. Though concern about pollution of the atmosphere by emissions from motor vehicles has been increasing, there is little medical evidence of related damage to health, except in the case of the photochemical smog characteristics of Los Angeles and other cities. Considerable amounts of black smoke may be emitted over a period of 24 hr by aircraft taking off at a busy airport. The role of the World Health Organization is mentioned.

29810 **APTIC NO. 51073**

Petrovskiy, V. V.

FIFTIETH ANNIVERSARY OF THE COUNTRY S HEALTH SERVICE. *(50-letiye sanitarnoy sluzhby strany). Gigiena i Sanit., 37(9):3-9, Sept. 1972. 1 ref. Translated from Russian, 11p.*

The history of the Soviet Public Health Service and its achievements since 1922 are reviewed. Sanitation and epidemiological measures and attempts to stem epidemics of cholera, typhus, smallpox, and plague are described. Recent developments in environmental protection and social hygiene are reviewed. Measures have been undertaken for gasification, the introduction of district heating plants, and electrification, as well as providing factories with equipment for purification. Sound standards of maximum permissible amounts of harmful substances in the air and reservoirs have been experimentally put into practice.

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